







FleXible user-CEntric Energy poSitive houseS

Deliverable 3.2: EXCESS Data Management Framework





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Abstract

This deliverable describes the design and development of the EXCESS Data Management Platform and the elaboration of the EXCESS Common Information Model. The EXCESS Data Management Platform comprises various components that enable through their operation the ingestion and management of data in the EXCESS system, so that they can be made available for analysis by the other EXCESS ICT components towards the realization of the PEB concept in the buildings of the four demo sites of the EXCESS project. The methodology for the creation of the EXCESS Common Information Model is provided along with its concepts and the functionalities of the EXCESS Data Management Platform are described, while a navigation to the different components of the EXCESS Data Management Platform is presented.

Keywords

EXCESS Data Management Platform, EXCESS Common Information Model, concepts, functionalities, technologies





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EXECUTIVE SUMMARY

The deliverable D3.2 "EXCESS Data Management Framework" documents the design and development of the first release of the EXCESS Data Management Platform in the context of the Work Package 3 "Technology and User Integration via ICT". This deliverable comprises a direct outcome of the Task 3.2 "Interoperable Data Management Framework", which aims at the design and implementation of a message-oriented-middleware infrastructure, to facilitate the information exchange between all components of the EXCESS system along with the creation of the EXCESS Common Information Model that will enable the semantic and syntactic interoperability of data in the EXCESS system.

The EXCESS Data Management Platform is responsible for the collection, pre-processing and storage of data coming from the Distributed Information Systems of the four demo sites in order to be used subsequently for analysis and visualization purposes by the other components of the EXCESS system, namely the Data Analytics Framework, the Visualization and Blockchain applications and the Model Predictive Control component, towards the realization of the PEB concept in the buildings of the four demo sites.

The EXCESS Data Management Platform comprises several different components that enable the ingestion, pre-processing and storage of data:

- a) the Data Collection component, which enables the ingestion of data through various ways, such as file uploading, acquisition through APIs and Pub/Sub messaging.
- b) the Data Mapping component, which offers the mechanisms for the matching of the ingested data elements to the concepts of the EXCESS Common Information Model, assuring in that way the homogeneity of data in the EXCESS system so that they can be suitable for further processing by the various EXCESS ICT components. In particular, the EXCESS Common Information Model has been elaborated based on the study of the most important standards in the building and energy domain and on the sample datasets provided by the demo site partners.
- c) the Data Cleaning component, which allows the performance of cleaning rules on the collected datasets so that any erroneous data are curated.
- d) the Data Anonymization component, which provides the mechanisms for protecting the privacy and anonymity of sensitive and personal data in the EXCESS Data Management Platform.
- e) the Data Storage component, which enables the storage of the collected and pre-processed data in the secure repositories of the EXCESS Data Management Platform.
- f) the User Management Service, which provides the necessary user registration, authentication and authorization mechanisms, defining the access rights of the users and denying any unauthorized use of data in the EXCESS Data Management Platform.

The deliverable D3.2 describes the first release of the EXCESS Data Management Platform and has received input from the deliverable D3.1 "EXCESS ICT Architecture Blueprint" regarding the technical specifications of the designed platform. This deliverable also provides input to the tasks T3.3 "Core ICT platform services", T3.4 "Flexibility analysis and forecasting component", T3.5 "Building/ District monitoring and control component" and T3.6 "Block chain-enabled applications for local energy communities and flexibility trading", and their corresponding deliverables D3.3 "EXCESS Flexibility





Analytics Module", D3.4 "EXCESS Model-Predictive Control Algorithms" and D3.5 "EXCESS Blockchain Infrastructure and Applications", which are related with the design and development of the Data Analytics Framework, the MPC component and the Visualizations and Blockchain applications that will use the data stored in the EXCESS Data Management Platform for their operations. Moreover, the deliverable D3.2 will provide input to Task 4.2 "Demonstration Case Studies in main EU climatic zones" for the operation of the EXCESS Data Management Platform in the 4 demo sites of the EXCESS project. An updated version of the deliverable D3.2 will be available in M32 of the project, describing the final release of the EXCESS Data Management Platform accommodating the feedback coming from the demo sites operation and presenting any improvements and updates.



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Glossary

Acronym	Full name
API	Application Programming Interface
BIM	Building Information Modelling
CIM	Common Information Model
CSV	Comma-separated Values
DoA	Description of Action
DMP	Data Management Platform
DX.Y	Deliverable X.Y
EXCESS	FIEXible user-CEntric Energy poSitive houseS
gbXML	Green Building schema
ICT	Information, Communication and Technology
IFC	Industry Foundation Classes
JSON	JavaScript Object Notation
MPC	Model Predictive Control
obXML	Occupant behaviour XML
OpenADR	Open Automated Demand Response
PEB(s)	Positive Energy Building(s)
SAREF	Smart Applications REFerence ontology
SAREF4BLDG	Smart Applications REFerence ontology for Buildings
SAREF4ENER	Smart Applications REFerence ontology for Energy
USEF	Universal Smart Energy Framework
WP	Work Package
XML	Extensible Markup Language



1 Introduction

1.1 Purpose and scope of the document

The deliverable D3.2 "EXCESS Data Management Framework" documents the outcome of the activities performed in the context of the Task 3.2 "Interoperable Data Management Framework" leading to the design and implementation of the EXCESS Data Management Platform and the EXCESS Common Information Model.

The EXCESS Data Management Platform has been designed based on the technical specifications described in the deliverable D3.1 "EXCESS ICT Architecture Blueprint" and its first implemented release enables the collection, pre-processing and storage of data so that they can be available for analysis and visualization purposes to the rest of the EXCESS ICT components towards the realization of the PEB concept in the buildings of the four demo sites of the EXCESS project.

In order to assure that interoperable and aligned data will reside in the EXCESS Data Management Platform, the EXCESS Common Information Model has been elaborated, comprising a common language for all data that are collected and stored in the EXCESS Data Management Platform. The EXCESS Common Information Model is based on the most prominent standards on the energy and building domain and is created according to the sample datasets provided by the demo site partners. These samples are based on the datasets that will be sent by the Distributed Information Systems of the four demo sites to the EXCESS Data Management Platform.

The EXCESS Data Management Platform enables the collection, pre-processing and storage of data coming from the Distributed Information Systems of the four demo sites and comprises various components for the performance of its operations, namely the Data Collection component, the Data Mapping component, the Data Cleaning component, the Data Anonymization component and the Data Storage component. The functionalities and technical details of these components are described within this deliverable and the navigation to the different components of the EXCESS Data Management Platform is provided.

The deliverable D3.2 provides input to the rest of the design and development tasks of WP3, which are T3.3, T3.4, T3.5, T3.6, and their corresponding deliverables D3.3, D3.4 and D3.5, as their related EXCESS ICT components will use the data stored in the EXCESS Data Management Platform for their operations, as well as to T4.2 that is related with the operation of the EXCESS system in the demo sites. In M32, an updated version of the D3.2 deliverable will be delivered, describing the final release of the EXCESS Data Management Platform that will encapsulate the feedback coming from the demonstrators and will include refinements and updated functionalities.

Suite5 has developed the EXCESS Data Management Platform and the EXCESS Common Information Model, while the demo site leaders are developing the interfaces of the Distributed Information Systems of the demo sites and have provided support and knowledge for the development of the EXCESS Common Information Model.

1.2 Structure of the document

In order to address all the aspects relevant to the scope of T3.2, the present deliverable has been structured as follows:



- Section 1 introduces the work performed and the scope of this deliverable along with the deliverable's structure.
- Section 2 presents an overview of the EXCESS Data Management Platform.
- Section 3 presents the methodology followed towards the definition of the EXCESS Common Information Model, along with the analysis and description of standards, ontologies and semantic data models considered as relevant to the domains-of-interest of EXCESS. Additionally, the basic definitions and terminology of the delivered data model are presented, along with its design guidelines and any decisions taken during its modelling phase.
- Section 4 describes the Data Collection component along with the technologies exploited and the related API and software information.
- Section 5 presents the Data Mapping component along with the technologies exploited and the related API and software information.
- Section 6 describes the Data Cleaning component along with the technologies exploited and the related API and software information.
- Section 7 presents the Data Anonymization component along with the technologies exploited and the related API and software information.
- Section 8 describes the Data Storage component along with the technologies exploited and the related API and software information.
- Section 9 presents the User Management service along with the technologies exploited and the related API and software information.
- Section 10 provides a thorough navigation among the different components of the EXCESS Data Management Platform.
- Finally, in section 11, the main conclusions of the work are reported.



2 EXCESS Data Management Platform Overview

The EXCESS Data Management Platform comprises a part of the EXCESS system, which shall enable through its operation the realization of the PEB concept in the buildings of the four demo sites of the EXCESS project. The EXCESS Data Management Platform constitutes the cornerstone of the EXCESS ICT Architecture as it enables the collection and management of data coming from the sensors, devices and energy components of the Distributed Information Systems in the four demo sites. The Distributed Information System of each demo site building will provide data regarding the energy demand, energy generation, energy storage and energy components operation along with building's ambient indoor conditions and weather conditions (e.g. both indoor and outdoor temperature, humidity, luminance, etc.).

The different components of the EXCESS Data Management Platform facilitate the ingestion and preprocessing of these data so that they can be subsequently used by the EXCESS Data Analytics Framework for analysis purposes, by the Model Predictive Control component for optimization of control strategies and by the visualization and blockchain applications for their operations.

As depicted in the below figure that shows the whole EXCESS high-level ICT system architecture, the EXCESS Data Management Platform comprises the Data Collection component, the Data Mapping component, the Data Cleaning component, the Data Anonymization component, the Data Storage component and the User Management service.



Figure 2-1: EXCESS High-Level ICT Architecture

The **Data Collection component** allows the ingestion of data coming from different sources and with various formats, such as weather data, intra-building conditions data and devices' operation data. This is enabled through the provision of the following data collection capabilities: (i) file uploading, (ii) acquisition through APIs offered by the local data platforms of the demo sites and (iii) Pub/Sub messaging.

The **Data Mapping component** enables the matching of the elements of the collected datasets to the equivalent concepts of the **EXCESS Common Information Model** in order to enhance the



interoperability and integration of the collected data in the EXCESS Data Management Platform. The **EXCESS Common Information Model** has been developed based on the most important standards of the energy and building domain and taking into account the sample datasets offered by the demo sites partners. In this sense, it comprises a common dictionary for all datasets in the EXCESS Data Management Platform that facilitates their use for further analysis and visualization purposes.

The **Data Cleaning component** enables the curation of the ingested datasets in case they have any erroneous data or inconsistencies. Therefore, the data can be cleaned, for example, from any outliers or missing values and become suitable for analysis purposes.

The **Data Anonymization component** allows the performance of mechanisms that ensure the privacy and security of personal and sensitive data coming in the EXCESS system.

The **Data Storage component** realizes the secure storing of collected datasets, after the aforementioned pre-processing activities, in the EXCESS Data Management Platform, so that they can be available for the operations of the rest of the EXCESS ICT components, namely the EXCESS Data Analytics Framework, the MPC component, the EXCESS Data Visualizations Framework and the EXCESS Blockchain Applications.

The **User Management Service** organizes the authentication and authorization mechanisms of the EXCESS Data Management Platform, specifying the access rights of the users and prohibiting any unauthorized access on data.

The first release of the EXCESS Data Management Platform is deployed at: https://excess.s5labs.eu/ (credentials can be provided upon request)

The various components of the EXCESS Data Management Platform along with the EXCESS Common Information Model are described in further detail in the following sections of the deliverable.



3 EXCESS Common Information Model

In order to fulfil the objectives of the project, all datasets collected from the various Distributed Information Systems of the demo sites will be stored in the EXCESS Data Management Platform, under a "common language" enabling both syntactic and semantic interoperability in order to make them available for further analysis and visualization purposes in the EXCESS system.

Such a common language will be accomplished through the design and development of the EXCESS Common Information Model (CIM) constituting the cornerstone of the Data Mapping component (see Section 5), since the elements of the collected datasets will be mapped against the equivalent concepts of the EXCESS CIM resulting in a homogeneous form of data stored in the EXCESS Data Management Platform.

3.1 Methodology

Towards the definition and delivery of a thorough data model capable of addressing all the project's needs, the methodology shown below was followed, with the ultimate target to ensure that the delivered model:

- addresses all the project's demo sites data needs and end users' requirements,
- is designed based on the requirements of the EXCESS Data Management Platform,
- is built upon consideration of the most prominent standards in the building and energy domain.
- is scalable during its lifecycle, i.e., it is designed in such a way to allow for future modification, addition or deletion of its entities if required.





<u>EXCESS</u>



As shown in the above figure, the initial step towards the design and definition of the first release of the EXCESS CIM, focused on the identification of the project's data requirements and needs. Through the use of an adequate template, the demo site partners declared their data availability, their prospect data needs and any open data requirements that the EXCESS system shall incorporate. This exercise made it possible to define an extensive list of all available (and future) datasets used within the EXCESS project, forming the basis of the modelling activities. The input of the demo site partners that filled in the data availability template is presented in Annex: Data Collection Exercise.

Having identified the data needs of the project's demo site partners, the focus was then given on reviewing/analysis of state-of-the-art standards considered as relevant to the EXCESS project's domains-of-interest (such as the building domain and the energy domain). Prior to the actual analysis, the selection of the most applicable material took place according to their relevance and applicability to EXCESS-specific activities (e.g., data acquisition, building energy management systems etc.), their maturity and support by the respective community. An overview of the standards reviewed is presented in the section 3.2.

The next step of the work involved the extraction of the high-level concepts that are related to the scope of EXCESS, along with their relationships (i.e., the nesting of the data model concepts) as presented in section 3.5. As an outcome of the aforementioned activities, the detailed modelling of the high-level concepts took place, along with their associated "sub-concepts" and fields. During this last step, the mapping of each concept and its fields to specific standards (where applicable) and configuration of any additional metadata that were required took place.

Overall, the EXCESS CIM has been designed and developed upon a detailed study and analysis of the data that the Distribution Information Systems of the EXCESS demo sites will attain through the installed sensors, submeters and actuators along with all deployed devices and energy systems residing in the demo site buildings. The EXCESS CIM is also based on widely-accepted standards in the energy and building domain, as described in the following section.



3.2 Related energy and building domain standards

Following the methodology for the design and development of the EXCESS CIM, this section provides an overview of the standards that are considered as highly relevant to the building and energy domain and which have been used as a basis, where applicable, during the development of the first release of the EXCESS CIM.

• Smart Applications REFerence (SAREF) ontology

The SAREF ontology was developed by the Dutch institute TNO aiming to facilitate interoperability between different solutions developed by different providers and among different assets in the smart applications domain [1]. The SAREF ontology aims to provide discrete and reusable elements of the ontology based on the users' needs and is built on the following key principles:

- the concepts of an existing asset can be reused and aligned accordingly
- the different elements of the ontology can be separated and/or recombined as per user needs
- the ontology can be further extended
- the processes of updating, identifying and correcting defects in the ontology, are easily maintainable [2]

The SAREF ontology enables users to create various device and technology abstraction layers and their corresponding common Application Programming Interfaces (APIs), without having knowledge of specific standards. An overview of the core concepts (i.e., main classes) of the latest version SAREF-v3.1.1 and their relationships is presented in the figure below.



Figure 3-2: Core classes of SAREF ontology [1]

The core classes of SAREF include concepts, such as: Device (e.g., Light Switch, temperature sensor, etc.), Property (e.g., Temperature, Energy, Occupancy, etc.), Command (e.g., OnCommand, OffCommand, etc.). In general, SAREF is built in a modular way, allowing the definition of any device from pre-defined building blocks, based on the function(s) that the device performs. This can be easily seen in the following example and the above figure: A saref:Device has at least one function (saref:hasFunction). Moreover, a saref:Device can be used for (saref:isUsedFor property) offering a



commodity, such as saref:Water or saref:Gas. It can also measure a property, such as saref:Temperature, saref:Energy and saref:Smoke. Moreover, a device may consist of other devices (saref:consistsOf property) [1].

Further to the core SAREF ontology, more extensions have been published for different domains (e.g., Energy, Building, Environment, Smart Cities, Smart Agriculture, Water domain, etc.). The extensions considered to be highly relevant to the EXCESS CIM design include SAREF4ENER that focuses on the energy domain and SAREF4BLDG for the building domain, both analysed in this section.

• SAREF4ENER

SAREF4ENER constitutes an extension of the SAREF ontology, expressed as an OWL-DL ontology. It was developed through the collaboration of a key Italy (Energy@Home¹) and Germany (EEBus²) based industry association towards enabling the interconnection of their different data models. The latest version SAREF4ENER v1.1.2 extends the core SAREF ontology with 63 additional classes, 17 object properties and 40 data type properties [1]. In general, SAREF4ENER supports interoperability among different products/services developed in the smart home domain (e.g., smart appliances) from manufacturers that support the Energy@Home or EEBus data models with the focus given on demand response scenarios, where customers can offer flexibility to the Smart Grid through management of their smart home devices via any energy management system both at home or remote [3].

• Open Automated Demand Response (OpenADR)

Published by the OpenADR Alliance in 2010, the OpenADR is an internationally adopted smart-grid data model that enables the information exchange related to Demand Response (DR) programs between Electricity Service Providers, Aggregators and Consumers. OpenADR enables the management of the various distributed energy resources (DER) for flexibility providers, such as Aggregators and Utility companies. In general, the OpenADR is used to structure the messages exchanged between the different stakeholders involved in automatic demand response (Auto-DR) and DER management activities, in a consistent and interoperable way. OpenADR cannot be considered as a communication protocol per se, since it relies on existing open standards such as XML for exchanging DR messages and reports. The OpenADR was developed to automate and simplify DR and DER management activities through dynamic price and reliability signals allowing electricity consumers to regulate their energy usage, save money and improve their energy efficiency, resulting in improving the overall effectiveness of power distribution across the smart grid [4]. Recently, the International Electrotechnical Commission (IEC) has approved the OpenADR 2.0 Profile Specification as a Publicly Available Specification (PAS), meaning that the OpenADR will become an IEC international standard.

• Universal Smart Energy Framework (USEF)

The USEF is an international standard facilitating the integration of various smart energy services and products and promoting energy flexibility trading by defining the various roles and their interactions, so that the demand-side participation can be fully utilized [5]. Developed by the USEF Foundation³, a non-profit industry association, this standard defines a market-oriented framework for standardizing the energy flexibility trading without constraining how the trading should be implemented, accepting both bilateral and exchange-based trading.

¹ http://www.energy-home.it

² http://www.eebus.org/en

³ https://www.usef.energy/usef-foundation/



Presently, in its latest version, USEF v1.3.6 is considered as the most important standard controlling the various energy flexibility trading market mechanisms. Each of the roles defined in USEF and their duties can be mapped to their real-life application in a local market; a brief description of the main roles defined in USEF is provided as follows:

- A Balance Responsible Party (BRP) is responsible for delivering supply and demand balance and identifying strategies that can reduce cost for covering potential network imbalances.
- A Distribution System Operator (DSO) is responsible for the optimal operation of the overall distribution network; depending on the market, a DSO might also carry out BRP responsibilities.
- An Aggregator, responsible for the management of the accumulated energy flexibility provided by the prosumers and based on the requirements set by the BRP.
- A Common Reference Operator (CRO) is responsible for assigning the congestion points and congestions to other involved parties.
- A Meter Data Company responsible for collecting and validating the energy consumers' metering data.
- An Active Demand and Supply is defined as the various entities that can be actively controlled with appropriate signals to adjust the energy supply and demand.
- \circ A Prosumer who is essentially the end user that can both consume and produce energy.

• Industry Foundation Classes (IFC)

The IFC, published by buildingSMART International, offers a digital representation of the building domain and its associated assets, enabling information exchange among the various AEC stakeholders involved in a particular project or building asset over its lifecycle. The latest version, IFC4 is provided as an open specification for Building Information Modelling (BIM) data and comprises terms, concepts and data specification items that are derived from use within disciplines, trades, and professions that are involved in the building industry [6]. IFC4 includes the data schema, and reference data that are represented as EXPRESS or as an XML schema specification and as XML definitions of property and quantity definitions, respectively.

The IFC specification comprises four different conceptual layers namely: a) the Resource layer, including all individual schemas containing the definitions of the resources, b) the Core layer, which includes the kernel schema and the core extension schemas that contain the most general entity definitions, c) the Interoperability layer containing entity definitions specific to general products, processes or resource specialization that are used across various disciplines and d) the Domain layer, representing the higher-level layer containing entity definitions that are specializations of products, processes or resources that are related to a certain discipline, and they can be exchanged or shared within the whole data schema [6].

• SAREF4BLDG

SAREF4BLDG⁴ constitutes an extension of the SAREF ontology based on the IFC standard for building information exchanges. It includes devices defined by the IFC4 and intends to represent devices and other physical objects typically found in buildings, thus enabling an efficient interaction and integration among actors (e.g., engineers, architects, consultants, contractors, component manufacturers, etc.), processes and tools, during the life cycle of a building (Planning and Design,

⁴ https://saref.etsi.org/saref4bldg/v1.1.2/





Construction, Commissioning, Operation, Retrofitting/Refurbishment/Reconfiguration, and Demolition/Recycling). SAREF4BLDG is delivered as an OWL-DL ontology that extends SAREF with 72 classes, 179 object properties and 83 data type properties [7]. Such an ontology provides mechanisms to facilitate the exchange and interoperability of data between actors involved in various stages of a building life cycle [3]. SAREF4BLDG has been identified as closely relevant to EXCESS, since it has been created upon consideration of the overall Architecture, Engineering and Construction (AEC) domain. The core classes of its latest version, SAREF4BLDG v1.1.2, are shown in the figure below.



Figure 3-3: Overview of the SAREF4BLDG extension [7]

• Green Building schema (gbXML)

The gbXML has been created with the purpose to enable interoperability between 3D building information models (BIM) and architectural/engineering analysis software such as AutoCAD, ArchiCAD, etc., enabling them to communicate by carrying out the transfer of building information through an XML language schema. gbXML has been the most commonly used industry standard schema for over 20 years, and it is currently supported by 58 building energy analysis, BIM authoring and CAD software tools of different vendors [8]. The latest gbXML schema (v.6.01) is available from the website⁵, and includes over 500 elements and attributes that can be related to a building information, increasing the overall data exchange efficiency. Usage of gbXML enables storage of detailed building data (geometry, constructions, heating, cooling, air flows, lightning, etc.).

• Occupant behaviour XML (obXML)

On the way to address the need for a common language and new modelling processes for representing building occupant's behaviour, the IEA Annex 66 developed the DNAs framework, titled obXML schema and expressed as an XML schema. The main scope of obXML is to facilitate the linking between three main elements representing buildings, occupants and their behaviour [9]. The main part of the work is the behaviours' part which models occupant behaviour on the basis of Drivers, Needs, Actions

⁵ https://www.gbxml.org/



and Systems. In EXCESS CIM, such information can be utilised to define the relevant data exchange/storage formats for building information, increasing the overall data exchange efficiency.

3.3 Main outcomes and challenges

Having provided an overview of the standards identified as highly relevant to the scope of EXCESS CIM, this section presents a summary of the main findings and challenges that shall be taken into consideration for the design and development of the EXCESS CIM.

- There is no existing standard addressing in full the requirements of the intended EXCESS CIM and that could be adopted directly as the project's internal model.
- Many of the reviewed material define strict ontological relations; which means that users have to adhere to the selection of abstractions set in the standards. Any additions in the ontology will require an adjustment of the overall ontological definition and placement of a new class within the modelling ontology. This is unfavourable for the case of EXCESS CIM, as it is foreseen to expand and evolve during the project's lifecycle.
- One of the key challenges to be addressed is the different level of development in different fields;
 i.e., many users utilise the IFC extensively for building data model representation, while others use ontologies defining a building asset as an operating system (e.g., SAREF4BLDG). It is thus evident that accomplishing interoperability with these standards is essential.
- Even though, there are existing standards that cover quite extensively domain/fields relevant to the EXCESS (such as the energy and building domain), they have a certain focus; which represents a challenge since the EXCESS data modelling shall be applicable in different fields.

3.4 EXCESS CIM design considerations and guidelines

Prior to presenting the design consideration and guidelines driving the overall development of the EXCESS CIM, this section provides initially the definition of its basic terms:

- **Concept**: An abstraction of a real-world/physical object (e.g., Sensing Device, Building) in the EXCESS CIM that describes its characteristics (e.g., id, type, etc.), and the relationship with other concepts, under a particular domain. For example, a Sensing Device could be modelled as a concept, with its properties/attributes (such as sensor measurement) defined as its fields.
- Field: A single characteristic/ property of a certain concept modelled in the EXCESS CIM (e.g., for the "SensingDevice" concept, potential fields might include its id, manufacturer, name, type, measurementUnit, serialNumber, measurementDateTime, status, etc.). The relations between the various concepts are modelled by defining an object-type field that refers to another defined concept. In the case of a "SensingDevice" example, the relationship between the SensingDevice and its measurements is defined via an object-type field "relatedSensingDeviceMeasurements" which refers to the concept measurement that includes fields such as id, description, value, etc.

A number of design considerations that have been made during the development of the EXCESS CIM are presented, constituting also functional requirements for the data model. Such requirements entail what is needed from the delivered data model, in order to fulfil its functionalities and successfully support the operations of the EXCESS Data Management Platform (DMP).



- As the EXCESS CIM will be responsible for effectively managing the semantics of the data collected in the EXCESS Data Management Platform while ensuring interoperability, the EXCESS CIM shall be able to incorporate the proper level of semantics enabling interoperability, without making it difficult to implement it such as by following very-strict standards.
- 2. The EXCESS CIM shall support the efficient operation of the EXCESS Data Management Platform by ensuring that all the related semantics are kept together with the collected data in order to facilitate the analysis and visualization purposes of the EXCESS system.
- 3. In order for EXCESS to fulfil its objectives successfully, interoperability must be accomplished both at technical and at semantic level. It is thus essential to deliver consistent and non-ambiguous data interpretation towards properly identifying the semantics; which represents a key challenge for a system that interacts with several different data sources.
- 4. In order for EXCESS to be able to integrate existing data from diverse data sources, the EXCESS CIM will require the addition of new modelling properties which aim directly at enabling interoperability.
- 5. The EXCESS CIM shall be designed to allow extensibility by providing adequate extension processes and allowing model upgrades, as the EXCESS system may potentially evolve.
- 6. The EXCESS CIM shall utilise existing standards in order to provide mappings to existing data representations resulting from the respective data collection tasks.

Further to the analysis of relevant domain-specific data standards and the identification of the EXCESSspecific data needs, the delivery of the EXCESS CIM relies also on the definition of an appropriate design, adhering to particular guidelines. Such guidelines (see table below) were decided based on the aforementioned considerations and drove the overall design activities of the EXCESS CIM, resulting in the definition of its high-level domain concepts and their respective fields and related concepts.

ID	Description
01	The EXCESS CIM shall include all concepts and their relationships that could be modelled in
	terms of the data, in order to cover both the current data needs of the EXCESS end users, but
	also future data needs that may arise.
02	All the concepts and their relationships in the EXCESS CIM shall consist of an adequate number
	of fields that describe effectively (as practicably possible) a particular real-world object.
03	The EXCESS CIM shall comply with existing relevant data standards focusing on the energy and
	building data exchange modelling. Nevertheless, adoption of their concepts and fields does
	not imply that the design of the EXCESS CIM shall focus on a specific direction but rather
	towards addressing the EXCESS end users' needs.
04	The EXCESS CIM shall be updated and assessed on a regular basis to preserve consistency and
	ensure its efficient evolution. As such, the EXCESS CIM shall deliver functionalities including
	addition, update, and deprecation of its concepts/fields ensuring extension and scalability.
05	The level of abstraction between concepts, fields, and relations shall be properly defined, since
	the data to be loaded in the EXCESS Data Management Platform by the demo site partners
	might have a different structure.
06	The granularity level of the data that are to be loaded in the EXCESS Data Management
	Platform shall be also considered to determine whether the data denote static or dynamic
	properties of a concept or field.
07	The EXCESS CIM shall adhere to the following naming and syntactic rules:

Table 1: EXCESS CIM design guidelines





	\circ The names of the concepts and fields may consist of word combinations as long as their
	meaning is easily understood.
	• Concepts' names shall comply with the upper camel case convention, i.e. without spaces
	or punctuation, indicating the separation of words with a single capitalized letter and the
	first letter of the entire word is uppercase.
	\circ Fields' names shall comply with the lower camel case convention, i.e. the first letter of
	the entire word is lowercase, but subsequent first letters are uppercase.
	 The names of concepts and fields shall be expressed as nouns.
08	The description of concepts and fields shall be clear and easy to understand, while a common
	domain vocabulary shall be adopted to avoid the use of alternative words that describe the
	same concepts, in order to ensure a common interpretation.
09	The EXCESS CIM shall include clear and explicit concepts; meaning that the level of concept
	nesting shall be chosen based on the specific case, so as to maintain only clear connections
	between the related concepts.
10	The various data types to be supported by the EXCESS CIM are listed as follows:
	• Date (e.g., 2021-06-01)
	 Datetime (e.g., 2021-06-01 13:33:00)
	• Time (e.g., 18:22:45)
	• Double (e.g., 0.003)
	• Integer (e.g., 12)
	Boolean (e.g., TRUE or FALSE)
	 Object (implies a reference to another concept)
	• String (e.g., "text")
11	Depending on the data type, the values of data shall follow a specific format or be within a
	specific range, allowing the appropriate transformations to take place in the EXCESS Data
	Management Platform. For example, the values of "double" data type shall include also their
	measurement unit (e.g., km, m, cm etc.), while the values of "datetime" data type should
	follow a particular form and their corresponding time zone (e.g., UTC).

3.5 Definition of EXCESS CIM high-level concepts

Taking into consideration the analysis of the EXCESS project's requirements and that of the landscaping of standards in the previous sections, as well as the aforementioned design considerations and guidelines, the definition of the EXCESS CIM high-level concepts is presented in the table below, specifying their category (mainly for their presentation needs) and defining the associated fields of each high-level concept.

Overall, this first version of the EXCESS CIM includes 92 high-level concepts along with their fields. It shall be noted that the resulting EXCESS CIM is designed and modelled to be as complete as possible, including all possible concepts and fields. Nevertheless, this first version of the EXCESS CIM is expected to be updated with additions (or deprecations) of concepts/fields so as to address all data needs emerging throughout the project's implementation, where necessary.





Table 2 EXCESS CIM: High level concepts and associated fields

High-level Concept	Fields			
Category: Generic				
Address	id, name, description, type, addressLine, cityCode, cityName, countryCode, countryName, districtName, streetName, buildingName, buildingNumber, floorNumber, apartmentID, plotID, postalCode, postOfficeBox, region, status			
ContactPerson	name, type, description, title, familyName, role, emailAddress, departmentName, jobTitle, contactNumber, faxNumber			
Location	id, name, description, type, altitude, latitude, longitude, latitudeDirectionIndicator, systemID, radius longitudeDirectionIndicator,PolygonPoint			
Period	id, name, description, type, startDateTime, endDateTime, earliestStartDateTime, latestEndDateTime, maxDuration, minDuration, defaultDuration, durationAbsoluteUncertainty, durationPercentUncertainty, optionalIndicator, pauseTime, referenceDateTime, referenceDay, referenceDayNumber, referenceMonth referenceMonthNumber, referenceYear, referenceWeekNumber, seasonCode, sequenceNumeric, weekdayIndicator, weekendIndicator			
Status	id, name, description, type, manualOverride, conditionCode, conditionIndicator,referenceDateTime, reason, reasonCode, remarks, statusCount, testResult, overchargedStatusIndicator, underchargedStatusIndicator			
Category: Equipment				
AirConditioner	id, name, description, type, airflowRate, brandName, code, model, coolingCapacity, coolingMedium, externalSurfaceArea, europeanSeasonalEnergyEfficiencyRatio, heatingCapacity, internalRefrigerantVolume, internalSurfaceArea, internalWaterVolume, manufacturerName, maximumCapacity, minimumCapacity, nominalCapacity, nominalCoolingLoad, nominalHeatingLoad, nominalVoltage, nominalHeatTransferArea, nominalHeatTransferCoefficient, nominalNoiseLevel, nominalPartLoadMax, nominalPartLoadMin, nominalPartLoadRatio, performanceCoefficient, refrigerantName, refrigerantClass, serialNumber seasonalEnergyEfficiencyRatio, supplyAirTemperature, exitAirTemperature, wasteAirTemperature			
AirConditionerControlOperation	id, name, description, type, coolingSetpoint, createdDateTime, updatedDateTime, fanDirection, fanSpeed, heatingSetpoint, timerIndicator, temperatureSetpoint,modeSetting, powerSwitch, reportedDateTime			
AutomatedOperationProfile	id, name, description, activatedDateTime, configuration, createdDateTime, updatedDateTime, status, remoteControlIndicator, reselectionSupportIndicator, singleSlotSchedulingIndicator, totalSequencesCount			



Battery	id, name, description, type, code, duration, autonomy, brandName, model, serialNumber, cellsInParallelCount, cellsInSeriesCount, chargeVoltage, cutOffVoltage, cyclel ife, depthOfDischarge, dischargeBate
Duttery	manufacturerName maxCanacity maxChargeCurrent maxChargeRate maxDischargeCurrent minChargeStatus
	nominalCanacity nominalEnergyDelivered nominalVoltage ratedCanacity roundTrinEfficiency
BatteryControlOperation	id name description type chargingSwitch createdDateTime undatedDateTime reportedDateTime
	dischargingSwitch_stateOfChargeIndicator
	id name description type brandName code serialNumber energySource model flowMode beatingLoad
	heatingSurfaceArea manufacturerName, operatingMode, nominalCanacity, nominalEnergyConsumption
Boiler	nominalEnergyConsumptionRate_nominalPartLoadRatio_nominalPower
Donei	nominalThermalEfficiencyoutletTemperatureMax_outletTemperatureMin_outletTemperatureBange
	parasiticElectricConsumption, parasiticElectricLoad, pressurePating, storageCapacityAvailability
	waterInletTemperatureMax, waterInletTemperatureMin, waterInletTemperaturePange, waterStorageCapacity
BailarCantralOparation	id name description type newerSwitch createdDateTime reportedDateTime temperatureSetpoint
Boller Control Operation	timerindicator, undated DateTime
	description tune socialNumber brandName code deviceName expectedDeverTune bardwareDevision
Device	description, type, senainumber, brandname, code, devicename, expectedPowerType, nardwarekevision,
Device	manufacturerLaber, manufacturerName, model, nodelb, nominalPower, powerSkewness, powerSource,
DeviceControlEvent	powerstandardDeviation, powerviax, powervin, softwareRevision, vendorCode, vendorName
DeviceControlEvent	id, type, createdDateTime, occurenceDateTime, occurenceDescription, reportedDateTime, updatedDateTime
	id, name, description, type, capacityPercent, setpoint, consumeActionDescription, createdDateTime,
DeviceControlEventOperation updatedDateTime, reportedDateTime, offsetLevel, offsetPercent, operationModeChange,	
	produceActionDescription
DeviceControlStatus	id, name, description, type, createdDateTime, reportedDateTime, updatedDateTime, consumeLoadControlStatus
	produceLoadControlStatus,
ElectricVehicle	id, name, description, type, brandName, code, efficiency, manufacturerName, nominalDrivingRange,
	nominalVoltage, releaseDateTime, serialNumber, typicalRechargeTime, upstreamEmissions
ElectricVehicleChargingPoint	id, name, type, chargingMode, effectiveChargingPower, effectiveCurrent, maxChargingPower, maxCurrent
ElectricVehicleChargingPointControl	id, name, description, type, chargingModeSwitch, chargingPowerClass, chargingTime, createdDateTime,
Operation	updatedDateTime, powerSwitch, reportedDateTime, timeIndicator
DomesticWaterHeater	id, name, description, type, brandName, code, manufacturerName, model, title, nominalPerformanceEffciency,
	serialNumber, nominalPower, volume
DomesticWaterHeaterControlOpera	id, name, description, type, timerIndicator powerSwitch, createdDateTime, updatedDateTime,
tion	reportedDateTime, temperatureSetpoint
Gateway	id, name, description, type, brandName, code, manufacturerName, model, serialNumber



BufferTank	id, name, description, type, serialNumber, brandName, code, storageCapacity, storageLevel, storageMaxTemperature		
BufferTankControlOperation	id, name, description, type, timerIndicator powerSwitch,createdDateTime, updatedDateTime, reportedDateTime, temperatureSetpoint		
BoreholeThermalEnergyStorageSyst em	id, name, description, type,flowRate, supplyTemperature, returnTemperature, HeatOutput		
BoreholeThermalEnergyStorageSyst emControlOperation	id, name, description, type, timerIndicator powerSwitch, createdDateTime, updatedDateTime, reportedDateTime		
HeatPump	id, name, description, type, serialNumber, brandName, code, airflowRate, energyEfficiencyRatio, heatingCapacity, manufacturerName, maximumCapacity, minimumCapacity, model, nominalCapacity, nominalHeatingLoad, nominalHeatTransferCoefficient, nominalVoltage, performanceCoefficient, outgoingTemperature, returnTemperature, mode, electricalConsumption, heatingOutput, coolingOutput, condensorSupplyTemperature, condensorReturnTemperature, condensorFlowrate, energyConsumption, evaporatorSupplyTemperature, evaporatorReturnTemperature, evaporatorFlowrate, thermalOutput		
HeatPumpControlOperation	id, name, description, type, createdDateTime, heatingSetpoint, powerSwitch, reportedDateTime, updatedDateTime, temperatureSetpoint, timerIndicator		
LightingDevice	id, name, description, brandName, code, serialNumber, model, colorAppearance, colorRenderingIndex, colorTemperature, contributedLuminousFlux, lampBallastType, lampCompensationType, lampMaintenanceFactor, manufacturerName, nominalPower, numberOfDimmingScales, spectrumMin, spectrumMax, spectrumRange		
LightingDeviceControlOperation	id, name, description, type, colorSetting, colorTemperatureSetting, createdDateTime, dimmingLevel, modeSetting, powerSwitch, reportedDateTime, timerIndicator, updatedDateTime		
MeteringSystem	id, name, description, type, acquiredDateTime, brandName, code, manufacturerName, model, serialNumber		
SensingDevice	id, name, description, type, serialNumber accuracy, brandName, code, manufacturerName, model		
SmartAppliance	id, name, description, type, brandName, code, manufacturerName, model, nominalVoltage, serialNumber, stateOfCharge, typicalEnergyConsumption		
SmartApplianceControlOperation	id, name, description, type, heatingSetpoint, powerSwitch, createdDateTime, reportedDateTime, updatedDateTime, temperatureSetpoint, timerIndicator		
SpaceHeater	id, name, description, type, bodyMass, brandName, code, energySource, heatTransferDimension, heatTransferMedium, manufacturerName, model, mode, nominalPower, nominalVoltage, outputCapacity, panelsCount, placementType, sectionsCount, serialNumber, temperatureClassification, thermalEfficiency, thermalMass, typicalEnergyConsumption		



SpaceHeaterControlOperation	id, name, description, type, heatingSetpoint, powerSwitch, createdDateTime, reportedDateTime, updatedDateTime, temperatureSetpoint, timerIndicator			
VentilationSystem	id, name, description, type, brandName, code, serialNumber, defrostIndicator, heatTransferType, manufacturerName, model, operationTemperatureMax, operationTemperatureMin, primaryAirFlowRateMax, primaryAirFlowRateMin, secondaryAirFlowRateMax, secondaryAirFlowRateMin			
VentilationSystemControlOperation	id, name, description, type, createdDateTime, fanSpeed, powerSwitch, reportedDateTime, updatedDateTime, timerIndicator			
Category: Measurements				
EnergyConsumptionMeasurements	id, name, description, type, airConditionerLoad, baseLoad, batteryLoad, boilerLoad, createdDateTime, updatedDateTime, deviceLoad, diversifiedLoad, diversityFactor, peakLoad, forecastDateTime, forecastLoad, gridLoad, load, lightingDeviceLoad, loadFactor, loadProfileHourly, observedDateTime, smartApplianceLoad, EVChargingPoint spaceHeaterDeviceLoad, totalConsumptionHourly, totalConsumption, unmetLoad, utilizationFactor, ventilationSystemLoad			
EnergyProductionMeasurements	id, name, description, type, activePower, frequency, activeEnergyExport, totalUptime, createdDateTime, updatedDateTime, observedDateTime, activeEnergyExportGeothermal, activeEnergyExportPhotovoltaic, activeEnergyExportRenewable, activeEnergyExportSolar, activeEnergyExportSolarThermal, apparentPower, activeEnergyExportWind, averageCurrent, equivalentAvailabilityFactor, forecastDateTime, grossGeneration, grossGenerationGeothermal, grossGenerationPhotovoltaic, grossGenerationRenewable, grossGenerationSolar, grossGenerationSolarThermal, grossGenerationWind, netCapacityFactor, netCapacityFactorGeothermal, netCapacityFactorPhotovoltaic, netCapacityFactorRenewable, netCapacityFactorSolar, netCapacityFactorSolarThermal, netCapacityFactorWind, netGenerationSolar, netGenerationSolarThermal, netGenerationPhotovoltaic, netGenerationRenewable, netGenerationSolar, netGenerationSolarThermal, netGenerationWind, peakCurrent, peakToPeakCurrent, peakToPeakVoltage, peakVoltage, powerFactor, rmsCurrent, rmsVoltage, totalEnergyExportSolar, totalEnergyExportGeothermal, totalEnergyExportPhotovoltaic, totalEnergyExportRenewable, totalEnergyExportSolar, totalEnergyExportSolarThermal, totalEnergyExportWind, totalEnergyImport, totalPrimaryEnergySupply, totalPrimaryEnergySupplyPhotovoltaic, totalPrimaryEnergySupplyGeothermal, totalPrimaryEnergySupplyWind			
EnergyStorageMeasurements	id, name, description, actualEnergyStored, chargeSetpoint, chargeStatus, createdDateTime, energyDeliveredSinceLastCharge, energyObtainedFromStorage, forecastDateTime, numberofCycles, observedDateTime, operationTimeSinceLastCharge, remainingUsefulLife, stateOfCharge, stateOfHealth, stateOfSafety, targetEnergyStored, throughput, totalEnergyDelivered, totalOperationTime, updatedDateTime			
Measurement	id, name, description, value, createdDateTime, measuredDateTime, measurementUnit, reportedDateTime			



	acousticPressure, airQualityIndex, alarmTemperature, batteryCoolantIntakeTemperature, createdDateTime, observedDateTime, batteryCollantOutputTemperature, forecastMaxTemperature, vocConcentration		
SensingDeviceMeasurements	co2Concentration, forecastMinTemperature, forecastTemperature, forecastTemperatureRange,		
	maxTemperature, meanTemperature, minTemperature, noiseLevel, occurenceDateTime, observedLuminance,		
	observedSoundPower, observedSoundPowerLevel, observedTemperature, temperatureChangeRate,		
	waterFlowRate		
	id, absoluteHumidity, atmosphericPressure, cloudiness, conditionDetails, conditionIntensity, conditionStatus,		
	description, measuredDateTime, precipitationProbability, precipitationRate, proximity, realFeelTemperature,		
MeteorologicalMeasurements	relativeHumidity, reportedDateTime, seaLevelPressureMax, seaLevelPressureMean, seaLevelPressureMin,		
	temperature, temperatureMax, temperatureMin, turbulenceIntensity, uvIndex, visibilityMax, visibilityMean,		
	visibilityMin, windDirection, windspeed, solarIrradiation, totalSolarRadiance, directSolarRadiance		
	solarRadiationHorizontal, solarRadiationDiffuse, solarRadiationVerticalWest, solarRadiationVerticalSouth		
Category: Plant			
	id, name, description, type, brandName, capitalCost, code, model, serialNumber, deratingFactor, efficiency,		
	levelisedCostOfElectricity, lifetime, manufacturerName, maxPowerPoint, maxPowerPointCurrent,		
PhotovoltaicGenerator	maxPowerPointVoltage, nominalCapacity, nominalVoltage, openCircuitVoltage, operatingCost, panelsCount,		
	powerTolerance, replacementCost, shortCircuitCurrent, temperatureCoefficient, temperatureCoefficientPercent,		
	supplyPipetemperature, returnPipetemperature		
PowerPlant	id, name, description, type, activeIndicator, code, energySource, site, status, typicalPowerOutput		
RenewableGenerator	id, name, description, controlMode, deadband, discreteMode, phase, status, targetUnit, targetValue		
VirtualPowerPlant	id, name, description, type, capacity, energySource, powerSourcesCount, scalability		
MeteorologicalStation	id, name, description, type, manufacturerName, model		
	id, type, additionalCapacity, cutBackInWindSpeed, cutInWindSpeed, cutOutWindSpeed, lifetime, noiseLevel,		
WindGenerator	nominalCapacity, nominalWindSpeed, operationTemperatureMax, operationTemperatureMin,		
	operationTemperatureRange, survivalSpeed, type, typicalEfficiency		
GeothermalPlant	id, name, description, type, activeIndicator, code, energySource, site, status, typicalPowerOutput		
Category: KPI			
KeyPerformanceIndicator	id, name, description, type, code, measurementUnit		
	measurementUnit, createdDateTime, maxValue, minValue, referenceDateTime, relativeDeviation, tolerance,		
KeyPerformanceIndicatorValue	updatedDateTime, value, valueRange, absoluteDeviation		



Category: Network				
ACLine	id, name, description, type, capacity, cableType, conductorDiameter, coreDiameter, impedance, layersCount, length, name, nominalCurrent, nominalCurrentMax, nominalFrequency, nominalVoltage, operatingCurrentMax, operatingVoltageMax, reactance, resistance, shortCircuitTemperature, shuntConductance, shuntSusceptance, status, type, transformersCount, zeroReactance, zeroResistance, zeroShuntConductance, zeroShuntSusceptance			
ConnectivityNode	id, name, connectionID, groundID, nodeType, nominalActivePower, nominalReactivePower, nominalVoltage, phaseType			
Grid	id, name, type, baseLoad, description, firmCapacity, nominalCapacity, nominalFrequency, operatingReserve, operatingReservePercent, peakDemand, spinningReserve, spinningReservePercent			
Category: Flexibility				
AggregatorPortfolio	id, name, description, appliancesCount, availabilityTimeline, connection, createdDate, generationAssetsCount, powerCapacity, prosumersCount, storageDevicesCount, updatedDate			
DemandSideManagementEvent	id, name, description, type, code, comment, createdDateTime, description, id, marketContext, status, priority, modificationDateTime, modificationCount, modificationReason, name, occurenceDateTime, startDateTime, rampUpDuration, testEvent			
DemandSideManagementEventSign al	id, name, type, currentValue, level, measurementUnit, targetValue, customerBidEnergySetpoint, energyPrice, customerBidLoadSetpoint, customerBidPrice, demandChargePrice, demandChargePriceRelative, demandChargePriceMultiplier, electricityPrice, electricityPriceRelative, electricityPriceMultiplier, energyPriceMultiplier, energyPriceRelative			
DemandSideManagementReportRea ding	id, name, description, type, accuracy, confidence, marketContext, periodicSamplingStatus, periodicSamplingIndicator			
DemandSideManagementReport	id, name, description, type, backDuration, code, createdDateTime, dataSource, status, duration, granularity, marketContext, optInType, requestID			
Flexibility	name, type, activationTime, baselineFlexibility, demandFlexbility, defaultDuration, duration, flexibilityForecast, forecastDateTime, generationFlexibility, observedDateTime, price, storageFlexibility			
LoadResponse	id, name, status, exponentModel, pConstantCurrent, pConstantImpedance, pConstantPower, pFrequencyExponent, qConstantCurrent, qConstantImpedance, qConstantPower, qFrequencyExponent			
Category: Flexibility Market				
FlexibilityContract	id, name, description, type, duration, activationDateTime, capacity, startDate createdDate, updatedDate, effectiveDate, expiryDate, customerType, payment, flexibiliyEventsNumber, penalties, phase, price, serviceCategory, terms, signatureDate			



FlexibilityContractPricingStructure	 id, name, description, type, code, status, region, customerType, baselineFlexibility, ceilingUsageConsumption, startDate, createdDate, endDate, ceilingUsagePower flexibilityPrice, floorUsageConsumption, floorUsagePower, serviceCategory 		
	id, name, description, type, duration, ancillaryService, balanceForecast, balancingRequirements, reason,		
	balancingService, clearanceDateTime, closureDateTime, constraint, demandForecast, price, primaryReserve,		
FlexibilityMarket	flexibilityRequirements, generationForecast, marketRole, marketVolume, participant, referenceDateTime,		
	secondaryReserve, tertiaryReserve, settlementDateTime		
FlexibilityOffer	id, name, description, baselineReference, creationDateTime, expiryDateTime,		
FlexibilityOfferOption	Price, duration, activationDateTime, activationTimes, maxFlexibilityCapacity, minActivationFactor,		
	optionReference		
FlexibilityRequest	id, name, description, type, activationDateTime, creationDateTime, duration, flexibilityAmount, status		
	id, actualPower, availablePower, baselineReference, deliveredFlexibilityPower, netSettlement, offeredPower,		
FlexibilitySettlement	orderedFlexibilityPower, penalty, powerDeficiency, price, requestedPower, reservedPower, settlementDate,		
	settlementStatus		
EnergyTariffProfile	id, name, description, chargeKind, code, consumptionSequenceNumber, consumptionStartValue, creationDate		
	endDateTime, fixedCostPart, sequenceNumber, scheduleCycle, startDateTime, variableCostPart		
Category: Building			
	id, name, description, type, subType, actualGrossArea, actualNetArea, bimFile, constructionEndDate,		
constructionMethod, constructionStartDate, coolingWetBulb, documentation, eavesHeight, totalHe			
	elevationOfRefHeight, elevationOfTerrain, energyPerformanceCertificationClass, fireProtectionClass,		
Building	grossFloorArea, heatingDesignDateTime, heatingDryBulb, heatingWetBulb, landmarkIndicator, netFloorArea,,		
	lastRefurbishmentDate, occupancyType, permanentIndicator, plannedGrossArea, plannedNetArea,		
	planningControlStatus, zonesCount smartReadinessAssessmentClass, sprinklerProtectionAutomaticIndicator,		
	sprinklerProtectionStatus, storeysCount, heatDemandForecast, aggregatedEnergybalance		
BuildingZone	id, name, type, actualGrossArea, actualNetArea, documentation, plannedGrossArea, plannedNetArea,		
	spacesCount, floorNumber		
	id, name, description, documentation, elevation, elevationWithFlooring, energyPerformanceCertificationClass,		
BuildingSpace	finishCeilingHeight, finishFloorHeight, grossFloorArea, netFloorArea, occupancyType, spaceHeight,		
	smartReadinessAssessmentClass		
BuildingFloor	id, name, description, actualGrossArea, actualNetArea, documentation, elevation, grossHeight, netHeight,		
	plannedGrossArea, plannedNetArea, floorNumber, zonesCount		
_	id, name, description, type, preference, acousticValueMax, acousticValueMin, createdDateTime, feedback,		
HumanComfort	IAQValueMax, IAQValueMin, occurenceDateTime, optimalAcousticValue, optimalIAQValue,		



	optimalThermalValue, optimalVisualValue, optimalAcousticRange, optimalIAQRange, optimalThermalRange, optimalVisualRange, satisfactionIndicator, thermalValueMin, thermalValueMax, visualValueMin, visualValueMax		
	id name description type areaPerOccupant code maxOccupantsCount minOccupantsCount		
BuildingOccupancy	occupancyTimePerDay, occupancyTimePerWeekDay, occupancyTimePerWeekendDay, occupantsCount		
buildingoccupancy	occupantsPeakCount		
BuildingOccupant	id name description age title hirthDateTime category familyName gender givenName lifestyle		
BullungOccupant	maidenName, middleName, nationality, profession		
Catagomy Stakeholdow	maidemname, mademane, nationality, profession,		
Category: Stakeholders			
DemandSideAggregator	Id, name, description, type, brandName, departmentName, legalClassificationCode, legalName		
BuildingManager	id, name, description, type, brandName, departmentName, legalClassificationCode, legalName		
LocalAdministration	id, name, description, type, legalName, departmentName, legalClassificationCode		
DistributionNetworkOperator	id, name, description, type, brandName, departmentName, legalName		
FlexibilityMarketOperator	id, name, description, type, brandName, departmentName, legalClassificationCode, legalName		
EnergyServiceProvider	id, name, description, type, brandName, departmentName, legalClassificationCode, legalName		
LocalEnergyCommunity	id, name, description, type, brandName, departmentName, legalClassificationCode, legalName, members,		
	membersCount		
Prosumer	id, name, description, age, birthDateTime, category, familyName, gender, givenName, maidenName,		
	middleName, nationality, profession, title, lifestyle		
PowerPlantOperator	id, name, description, type, brandName, departmentName, legalClassificationCode, legalName		
RenewableGeneratorOperator	id, name, description, type, brandName, departmentName, legalClassificationCode, legalName		
Category: Incidents			
Event	id, name, description, type, createdDateTime, modificationDateTime, modificationReason, occurenceDateTime,		
	priority, remarks, testIndicator, updatedDateTime		
Incident	id, name, description, type, subType actualRestorationTime, cause, effect, priority, status,		
	estimatedRestorationTime, forecastDateTime, workNotes, occurenceDateTime		
IncidentLog	id, name, description, type, subType, createdDateTime, updatedDateTime, totalFailureCount		
Schedule	id, name, description, type, activeIndicator, createdDateTime, duration, plannedDateTime.		
	plannedMaintenanceTime		
TroubleTicket	id, name, description, type, code, createdDateTime, reportedDateTime, resolvedDateTime, responsibleWorker		
Event	id, name, description, type, createdDateTime, modificationDateTime, modificationReason, occurenceDateTime.		
	priority, remarks, testIndicator, updatedDateTime		
1			



3.6 Alignment of EXCESS CIM concepts to relevant standards

As previously mentioned, the concepts of the EXCESS CIM were extracted upon analysis of existing relevant standards/models. Under this context and towards ensuring consistency, Table 3 below presents for each of the concepts included in the EXCESS CIM, the source concept and the relevant standard(s) which they align with (where applicable).

EXCESS CIM	EXCESS CIM Concept	Source Concept	Relevant Standard
Category			
	Address	-	N.A
General	ContactPerson	-	N.A
	Period	-	N.A
	Location	-	N.A
	Status	-	N.A
	AirConditioner	AirConditioningSystem	SAREF4BLDG
	AirConditionerControlOperation	-	N.A
	AutomatedOperationProfile	AutomatedOperationPr ofile	SAREF4ENER
	Battery	Battery	SAREF4ENER
	BatteryControlOperation	-	N.A
	Boiler	Boiler	SAREF4BLDG
	BoilerControlOperation	-	N.A
	Device	Device	SAREF, SAREF4ENER
	DeviceControlEvent	DeviceControlEvent	SAREF4ENER
	DeviceControlEventOperation	DeviceControlEventActi on	SAREF4ENER
	DeviceControlStatus	DeviceControlStatus	SAREF4ENER
	ElectricVehicle	-	N.A
Equipment	ElectricVehicleChargingPoint	-	N.A
	ElectricVehicleChargingPointContro IOperation	-	N.A
	DomesticWaterHeater	-	N.A
	DomesticWaterHeaterControlOper ation	-	N.A
	Gateway	-	N.A
	BufferTank	-	N.A
	BufferTankControlOperation	-	N.A
	BoreholeThermalEnergyStorageSys tem	-	N.A
	BoreholeThermalEnergyStorageSys temControlOperation	-	N.A
	HeatPump	-	N.A
	HeatPumpControlOperation	-	N.A
	LightingDevice	LightingDevice	SAREF4BLDG
	LightingDeviceControlOperation	-	N.A
	MeteringSystem	MeteringSystem	SAREF
	SensingDevice	Sensor	SAREF

Table 3 EXCESS CIM: High level	concepts and relevant stand	dards
--------------------------------	-----------------------------	-------





	SmartAppliance	SmartAppliance	SAKEF4BLDG
	SmartApplianceControlOperation	-	N.A
	SpaceHeater	SpaceHeatingDevice	SAREF4BLDG
	SpaceHeaterControlOperation	-	N.A
	VentilationSystem	VentilationSystem	SAREF4BLDG
	VentilationSystemControlOperatio	-	N.A
	EnergyConsumptionMeasurements	-	N.A
Magaziranaa	EnergyProductionMeasurements	-	N.A
ivieasuremen	EnergyStorageivieasurements	-	N.A
	Measurement	Measurement	SAREF
	SensingDeviceMeasurements	-	N.A
	MeteorologicalMeasurements	-	N.A
	PhotovoltaicGenerator	-	N.A
	PowerPlant	-	N.A
	RenewableGenerator	-	N.A
Plant	VirtualPowerPlant	-	N.A
	MeteorologicalStation	-	N.A
	WindGenerator	-	N.A
	GeothermalPlant	-	N.A
КРІ	KeyPerformanceIndicator	-	N.A
	KeyPerformanceIndicatorValue	-	N.A
	ACLine	-	N.A
Network	ConnectivityNode	-	N.A
	Grid	-	N.A
	AggregatorPortfolio	AggregatorPortfolio	USEF
	DemandSideManagementEvent	DemandResponseEvent	OpenADR
	DemandSideManagementEventSig	DemandResponseEvent	OpenADR
Flexibility	nal	Sign al	•
	DemandSideManagementReportRe	DemandResponseRepo	OpenADR
	ading	rtRea ding	
	DemandSideManagementReport	DemandResponseRepo	OpenADR
		rt	
	Flexibility	Flexibility	USEF
	LoadResponse	-	N.A
	FlexibilityContract	Contract	USEF
	FlexibilityContractPricingStructure	-	N.A
Flexibility	FlexibilityMarket	-	N.A
Market	FlexibilityOffer	Offer	USEF
	FlexibilityOfferOption	OfferOption	USEF
	FlexibilityRequest	Request	USEF
	FlexibilitySettlement	Settlement	USEF
	EnergyTariffProfile	-	N.A
	Building	Building	IFC
	BuildingZone	BuildingZone	IFC
	BuildingSpace	BuildingSpace	IFC
Building	BuildingFloor	BuildingStorey	IFC
	HumanComfort	Needs	obXML
	BuildingOccupancy	Occupancy	IFC
	BuildingOccupant	-	N.A





	DemandSideAggregator	-	N.A
	LocalAdministration	-	N.A
	DistributionNetworkOperator	-	N.A
	FlexibilityMarketOperator	-	N.A
Stakeholders	EnergyServiceProvider	-	N.A
	LocalEnergyCommunity	-	N.A
	Prosumer	Prosumer	USEF
	PowerPlantOperator	-	N.A
	RenewableGeneratorOperator	-	N.A
	BuildingManager	-	N.A
Incidents	Incident	-	N.A
	IncidentLog	-	N.A
	Schedule	-	N.A
	TroubleTicket	-	N.A
	Event	-	N.A



4 Data Collection component

4.1 Design and functionalities

The Data Collection component is responsible for the ingestion of data coming from various sources and with different formats in the EXCESS Data Management Platform. The Data Collection component offers a user-friendly interface that enables the data provider to define the necessary data collection configurations. The collection of data can be realized either through uploading of files (e.g., uploading of historical data in the EXCESS Data Management Platform) or through APIs or Pub/Sub mechanisms that are offered by the distributed information systems of the demo sites.

The functionalities of the Data Collection component are described below:

- a) **Definition of the data collection process in a user-friendly way:** The Data Collection component allows the configuration of the data ingestion process in the desired way through an easy-to-use interface, by enabling the selection of the collection options, the authentication specifications and other related details.
- b) Data ingestion through file uploading: The uploading of files of different formats, such as (i) tabular (e.g. CSV, TSV), (ii) non-tabular (e.g. XML, JSON) and (iii) others (i.e. non-text data) is enabled. The uploading of data samples of files is also provided, which drives the creation of the configuration files, including the data collection details defined by the data provider.
- c) Data acquisition through APIs: The Data Collection component enables the collection of data through the APIs that are offered by the local data platforms of the demo sites by providing a comprehensive interface for the definition of the API details. Moreover, the already configured API connection is tested and in case of success, sample data are collected. In addition, the management of data update through the APIs is facilitated by configuring the corresponding scheduling details.
- d) Management of API authentication details: The Data Collection component allows the data provider to define the authentication details of an API connection by setting the type of authentication and the related information, such as tokens or credentials. The Data Collection component uses these authentication details to verify the API connection.
- e) Data acquisition through Pub/Sub mechanisms: The Data Collection component enables the collection of streaming data through Pub/Sub mechanisms that are offered by the local data platforms of the demo sites by providing an easy-to-use interface for the definition of the connection and retrieval settings. Also, sample data are collected upon testing of the already configured Pub/Sub mechanisms.
- f) Option for storage of specific data: During the data collection process, the data provider is enabled to specify the part of the data sample that s/he would like to be stored in the EXCESS Data Management Platform. In that context, only the chosen data will be further processed, while the rest of them will be rejected and not be stored eventually in the EXCESS Data Management Platform.
- g) **Management of data update:** Regarding file uploading, the Data Collection component enables the update of an already stored dataset by allowing the uploading of an additional file with the same data structure. In this way, the already stored dataset will be appended with





the records of the new file, using the already defined pre-processing rules of the existing configuration file to speed-up the update process.

4.2 Technologies and tools

The Data Collection component implementation is written in Python⁶. The frontend comprises the user interface of the Data Collection component and is developed in VueJS⁷ and TailwindCSS⁸. The backend includes the different data collection options and is implemented with the Flask micro web framework⁹. The orchestration engine, based on Kubernetes¹⁰, manages the containerized services of the different processes in the EXCESS Data Management Platform. The Data Collection component uses a relational database for storage purposes exploiting PostgreSQL¹¹, along with a data lake for temporary storage needs utilizing MinIO¹². RESTful interfaces are utilized for the communication between the frontend and the backend of the Data Collection component using Swagger¹³.

4.3 APIs information

The Data Collection component communicates with the other components of the EXCESS Data Management Platform through a messaging functionality. The communication between the frontend and the backend of the Data Collection component is realized through internal APIs which support intra-component integration.

4.4 Software package repository

The Data Collection component is closed source and no source code is available publicly. The source code and the related deployment instructions are maintained in the related private repositories and the corresponding subcomponents are containerized with Docker¹⁴.

⁶ Python, https://www.python.org/

⁷ Vue.js, https://vuejs.org/

⁸ TailwindCSS, https://tailwindcss.com/

⁹ Flask, https://flask.palletsprojects.com/en/2.0.x/

¹⁰ Kubernetes, https://kubernetes.io/

¹¹ PostgreSQL, https://www.postgresql.org/

¹² MinIO, https://min.io/

¹³ Swagger, https://swagger.io/

¹⁴ Docker, https://www.docker.com/



5 Data Mapping Component

5.1 Design and functionalities

The Data Mapping component is responsible for the mapping of the elements of the collected datasets to the equivalent concepts of the EXCESS Common Information Model, enabling in that way the elaboration of interoperable and consistent datasets that can be utilized for further analytical processes in the EXCESS system. The EXCESS Common Information Model has been constructed based on the most important data standards in the energy and building domain and by analyzing and extracting the different entities from the datasets coming from the various Distributed Information Systems of the four demo sites and will be updated as long as new elements are needed to be mapped.

The functionalities of the Data Mapping component are described below:

- a) **Exploitation of various matching techniques for automated mapping predictions:** The Data Mapping component maps the data elements of the ingested dataset to the related concepts of the EXCESS Common Information Model. The automated mapping predictions are executed using different fuzzy matching techniques.
- b) Manual configuration of proposed mapping predictions: Through a user-friendly interface the Data Mapping component enables the data provider to check the proposed automated mappings and choose whether they should be maintained, updated or deleted. In addition, any unidentified concepts can be mapped manually to related concepts of the EXCESS Common Information Model. Moreover, the data types, measurement units and any other data transformations may be specified.
- c) Intuitive exploration of the EXCESS Common Information Model: The Data Mapping component enables the data provider to explore the Common Information Model, view its structure and get deeper knowledge of its concepts, allowing him/her in that way to choose if any manual mappings are more suitable for the data elements of his/her dataset.

5.2 Technologies and Tools

The Data Mapping component implementation is written in Python exploiting the NumPy¹⁵, Pandas¹⁶ and scikit-learn¹⁷ libraries. The frontend comprises the user interface of the Data Mapping component utilizing VueJS and TailwindCSS. The backend, which is developed based on the Flask micro web framework, includes the different data mapping services. The transformation service realizes the unit and any other data transformations, the prediction manager facilitates the automatic mapping process and the mapping configuration manager enables the manual modification of mapping predictions and the storage of final mapping selections in the configuration file. The Data Mapping component uses a relational database for storage purposes based on PostgreSQL, along with a data lake for temporary storage needs exploiting MinIO and an indexing engine for the EXCESS Common Information Model using Elasticsearch¹⁸. RESTful interfaces, based on Swagger, are utilized for the communication between the frontend and the backend of the Data Mapping component.

¹⁵ Numpy, https://numpy.org/

¹⁶ Pandas, https://pandas.pydata.org/

¹⁷ https://scikit-learn.org/stable/

¹⁸ Elasticsearch, https://www.elastic.co/



5.3 APIs information

The Data Mapping component communicates with the other components of the EXCESS Data Management Platform through a messaging functionality. The communication between the frontend and the backend of the Data Mapping component is realized through internal APIs which support intra-component integration.

5.4 Software package repository

The Data Mapping component is closed source and no source code is available publicly. The source code and the related deployment instructions are maintained in the related private repositories and the corresponding subcomponents are containerized with Docker.



6 Data Cleaning Component

6.1 Design and functionalities

The Data Cleaning component is responsible for the performance of the necessary quality checks on the collected data and the employment of the designated by the data provider cleaning rules in order to curate these data in case they include any errors or inconsistencies. The Data Cleaning component facilitates the curation of collected and mapped datasets so that they become suitable for further analysis purposes.

The functionalities of the Data Cleaning component are described below:

- a) Definition and performance of cleaning rules: The cleaning of the data is performed by the Data Cleaning component in case any errors are found during the validation checks, by offering a series of different cleaning rules that can be selected by the data provider in order to have curated datasets in the EXCESS Data Management Platform.
- b) **Option for elimination of missing values or outliers:** In case there are missing values or outliers in the ingested dataset, the Data Cleaning component enables the data provider to drop from the dataset the rows that contain such missing values.
- c) Option for replacement of missing values or outliers: In case there are missing values or outliers in the ingested dataset, the Data Cleaning component enables the data provider to replace these dataset fields by selecting through a list of potential replacement values, such as a specific default value set by the data provider, the maximum or the minimum value of the column where the missing value or outlier exists, etc.

6.2 Technologies and Tools

The Data Cleaning component implementation is written in Python exploiting the NumPy and Pandas libraries. The frontend comprises the user interface of the Data Cleaning component utilizing VueJS and TailwindCSS. The backend, which is developed based on the Flask micro web framework, includes the quality checking and cleaning services. In addition, the cleaning configuration manager enables the storage of cleaning selections in the configuration file. The Data Cleaning component uses a relational database for storage purposes based on PostgreSQL, along with a data lake for temporary storage needs exploiting MinIO. RESTful interfaces, based on Swagger, are utilized for the communication between the frontend and the backend of the Data Cleaning component.

6.3 APIs information

The Data Cleaning component communicates with the other components of the EXCESS Data Management Platform through a messaging functionality. The communication between the frontend and the backend of the Data Cleaning component is realized through internal APIs which support intracomponent integration.





6.4 Software package repository

The Data Cleaning component is closed source and no source code is available publicly. The source code and the related deployment instructions are maintained in the related private repositories and the corresponding subcomponents are containerized with Docker.



7 Data Anonymization Component

7.1 Design and functionalities

The Data Anonymization component is responsible for the performance of anonymization rules designated by the data provider in order to ensure the privacy and anonymity of datasets in case they include any sensitive or personal data or even quasi-identifiers that may reveal a person's identity through certain combinations of them. Through a user-friendly interface, the Data Anonymization component enables the data provider to choose how s/he may handle such sensitive information in order to store such datasets in the EXCESS Data Management Platform in a protected and secure manner.

The functionalities of the Data Anonymization component are described below:

- a) Definition and performance of anonymization rules: The Data Anonymization component provides an easy-to-use interface where the data provider can choose from a variety of different anonymization rules, which are employed in order to achieve the privacy and anonymity of datasets in the EXCESS Data Management Platform.
- b) Option for elimination of identifying data: In case the data provider designates that a column of a dataset contains data that identify personal or private information, the Data Anonymization component performs the dropping of this column in order to ensure the privacy of the dataset in the EXCESS Data Management Platform.
- c) **Option for masking or grouping of quasi-identifiers:** In case the data provider designates that a column of a dataset contains quasi-identifier data, the Data Anonymization component performs the masking or numerical grouping of this column (depending on the data type of the column, string or number respectively) at the necessary level in order to ensure the privacy of the dataset in the EXCESS Data Management Platform.

7.2 Technologies and Tools

The Data Anonymization component implementation is written in Python exploiting the NumPy and Pandas libraries. The frontend comprises the user interface of the Data Anonymization component utilizing VueJS and TailwindCSS. The backend, which is developed based on the Flask micro web framework, includes the anonymization service. In addition, the anonymization configuration manager enables the storage of anonymization selections in the configuration file. The Data Anonymization component uses a relational database for storage purposes based on PostgreSQL, along with a data lake for temporary storage needs exploiting MinIO. RESTful interfaces, based on Swagger, are utilized for the communication between the frontend and the backend of the Data Anonymization component.

7.3 APIs information

The Data Anonymization component communicates with the other components of the EXCESS Data Management Platform through a messaging functionality. The communication between the frontend and the backend of the Data Anonymization component is realized through internal APIs which support intra-component integration.





7.4 Software package repository

The Data Anonymization component is closed source and no source code is available publicly. The source code and the related deployment instructions are maintained in the related private repositories and the corresponding subcomponents are containerized with Docker.



8 Data Storage Component

8.1 Design and functionalities

The Data Storage component is responsible for storing data coming from the Distributed Information Systems of the four demo sites. As soon as the data have been collected and pre-processed, they are stored in a secure storage space in the EXCESS Data Management Platform. The Data Storage component facilitates scalability and big data management optimization, while data model indexing is used for model search performance improvement.

The functionalities of the Data Storage component are described below:

- a) **Storage of data collection tasks and related configurations:** The Data Storage component stores the properties of the data collection task along with the corresponding settings of the configuration file during the data collection configuration process.
- b) **Data persistence:** The Data Storage component stores the dataset along with the data sample, as soon as the data collection and pre-processing activities have been completed.
- c) **Data model indexing:** Following the storage of the EXCESS Common Information Model, the Data Storage component creates the necessary indexes for the stored data model in order to facilitate faster data model searching during the data mapping process.
- d) Intermediate data storage: The Data Storage component offers a temporary storage space, where the intermediate configuration and data files that are produced during the various data processes are stored, allowing in this way the pause and continuation of these processes. This approach enhances the fast resuming of these processes and supports traceability in case a specific data process fails.

8.2 Technologies and Tools

The Data Storage component includes for the realization of its functionalities a relational database based on PostgreSQL, a non-relational database using MongoDB¹⁹, a temporary storage data lake based on MinIO and a data model indexing engine using Elasticsearch.

8.3 APIs information

No external APIs are used by the Data Storage component.

8.4 Software package repository

The Data Storage component is closed source and no source code is available publicly. The source code and the related deployment instructions are maintained in the related private repositories and the corresponding subcomponents are containerized with Docker.

¹⁹ MongoDB, https://www.mongodb.com/



9 User Management Service

9.1 Design and functionalities

The User Management Service provides a series of features referring to the use of the EXCESS Data Management Platform by the users. More specifically, it offers the necessary mechanisms for user registration, authentication, login and analysis of the actions they perform over the different components involved in the EXCESS Data Management Platform, as well as it facilitates the specification of different user roles and groups in the EXCESS Data Management Platform. Moreover, the appropriate authorization and access control functionalities are applied for the verification of access rights of users over specific datasets according to the restrictions imposed by the data providers. In this sense, specific rights are assigned to the different users of the EXCESS Data Management Platform for accessing the data that are stored and are made available through the platform, while assuring that non-authorized users or user types will not have access to any data. Furthermore, the User Management Service offers a series of usage analytics that present information in a user-friendly way about the use of datasets by specific users and user groups, such as which datasets are searched or accessed more, how many datasets a user is accessing, etc., along with information and activity logs of the users over the different components and datasets (e.g. new dataset creation, modification of an existing dataset).

9.2 Technologies and Tools

The User Management service implementation is written in Python exploiting the NumPy and Pandas libraries. The frontend comprises the user interface of the User Management service utilizing VueJS. The backend, which is developed based on the Flask micro web framework, includes the user management and access policies services. RESTful interfaces, based on Swagger, are utilized for the communication between the frontend and the backend of the User Management service.

9.3 APIs information

The User Management service communicates with the other components of the EXCESS Data Management Platform through a messaging functionality. The communication between the frontend and the backend of the User Management service is realized through internal APIs which support intra-component integration.

9.4 Software package repository

The User Management service is closed source and no source code is available publicly. The source code and the related deployment instructions are maintained in the related private repositories and the corresponding subcomponents are containerized with Docker.



10 Navigation to the EXCESS Data Management Platform

Within this section, the navigation to the EXCESS Data Management Platform across its different components will be presented and the various functionalities of the EXCESS Data Management Platform will be displayed through descriptive screenshots.

10.1 Data Collection

In the first page of the EXCESS Data Management Platform, the user (i.e. data provider) sees the list of the already created data collection jobs along with their details, such as the execution status of each job and the steps that are included in each job. In addition, the user has the option to edit or delete a data collection job.

EXCESS	Data Collection Jobs Datasets	Search Models	About		¢		K Konstantinos Latanis 🗸
Data Collection .	lobs						+ Create
	excess test 3 Konstantinos Latanis	dated on Sep 21, 2021			COMPLETED	:	
	> Harvester 📀 test 3	> Mapping	0	> Loader ⊘			
	excess test 2 L Konstantinos Latanis 🗎 Up	dated on Sep 21, 2021			CONFIGURATION: HARVESTER	:	,
	excess test L Konstantinos Latanis 🗎 Up	dated on Sep 14, 2021			CONFIGURATION: MAPPING	:	

Figure 10-1: List of data collection jobs

By clicking on the "Create" button, the user can define the name and the description of a new data collection job along with the pre-processing steps that it will include. The harvesting and loading steps are mandatory. If the mapping step is selected for processing text data, the cleaning and anonymizing steps are also made available. For uploading files as single objects, such as images, the mapping step -and eventually the cleaning and anonymization steps- shall not be selected.

E×CESS	Data Collection Jobs Datasets Search Models	About	¢	K Konstantinos Latanis 🗸
Create Data Col	lection Job			X Cancel V Create
	Job Details Basic information about the Job	NAME excess test 4 DESCRIPTION test data collection job		
	Pre-processing Before importing your data to the platform, you can use additi tools to better prepare them	Analysis of the set of the s		

Figure 10-2: Create a data collection job

After creating the new data collection job, which is displayed in the aforementioned list of data collection jobs, the user may click on the data collection step where s/he is prompted to choose the method of data collection that can be:





- File uploading
- Acquisition through APIs offered by the local data platforms of the demo sites
- Pub/Sub mechanisms available by the local data platforms of the demo sites for streaming data

E×CESS	Data Collection Jobs Datasets Search Models	About			¢ (K Konstantinos Latanis 🗸
Configure Harv	rester: excess test 4			< Back to Jobs	Save Configuration	✓ Finalize Configuration
STEP 1 Setup Harvest Service			STEP 2 Test and Review Configuration			
	Data Loading How do you plan to load your data to the platform?	FILE UPLOAD Direct file upload (CSV, STREAMING DATA FR Collect streaming data f DATA PROVIDER'S AV Collect data from the AF	SON, XMU OM OWN PUBSUB MECHANISM Om the PubSub mechanism that is available on your e AILABLE API Is provided by applications and systems of the data p	end provider or from open Al	PIs	

Figure 10-3: Selection of data collection method

10.1.1 File uploading

When the user chooses to upload a file (e.g. uploading of historical data in EXCESS Data Management Platform to facilitate analysis purposes), s/he has to define the format of the file (i.e. CSV, XML, JSON) and also upload a data sample and the full file. The data sample contains a few rows of the file and is used in order to set-up quickly the pre-processing rules of the data collection job that are stored in the configuration file and can also facilitate the future update of the file to be uploaded.

EXCESS	Data Collection Jobs Datasets Search Models	About		Q	K Konstantinos Latanis 🗸
Configure Harve	ster: excess test 4			X Cancel Save Configuration	✓ Finalize Configuration
STEP 1 Setup Harvest Service			STEP 2 Test and Review Configuration		
	Data Loading How do you plan to load your data to the platform?	• FILE UPLOAD Direct file upload (CSV, JS	ion, xml)		
	Format Select the format of the file you will use	O CSV 🔾 JSON 🔿 XM	L 🔘 Other		
	Sample Upload Upload a sample of your data to be used in next steps	BROWSE DEXCESS ap	opliances_sample.csv 281.0 B		
	Upload File(s) Upload your file(s) to be processed (if in csv, json, and format)	BROWSE DEXCESS of	ppliances.csv 2.2 KB		
				Next >	

Figure 10-4: Configure file uploading options

By clicking on the "Next" button, the user is enabled to check the data sample before the next configuration activities of the EXCESS Data Management Platform begin.





EXCESS	Data Collection Jobs Datasets Sear	ch Models J	About		¢.	K Konstantinos Latanis 🗸
Configure Harvest	er: excess test 4				X Cancel Save Configuration	✓ Finalize Configuration
STEP 1 Setup Harvest Service				STEP 2 Test and Review Configuration		
	ADDED FILES D EXCESS appliances.csv				2.2 KB ×	
	BRAND	CODE	SPECS	IDENTIFIER	MANUFACTURER	
	Phillips laundry Siemens frost	DD8 TT1	Washing machine refrigerator	353453 645897	Phillips Siemens	
	Pitsos fridge Zanussi fridge	EE4 BB3	refrigerator refrigerator	975681 765893	Pitsos Zanussi	
	Miele dish	AA2	dish washer	274638	Miele	

Figure 10-5: Check the data sample

The user has the option to save the data collection job, while a corresponding popup message is displayed, and revisit it later at the same stage.

EXCESS	Data Collection Jobs Datasets Search	h Models A	bout			¢	K Konstantinos Latanis 🗸
Configure Harvest	er: excess test 4				< 1	Back to Jobs Save Configuration	✓ Finalize Configuration
STEP 1 Setup Harvest Service				STEP 2 Test and Review Cor	liguration		
	BRAND	CODE	SPECS		IDENTIFIER	MANUFACTURER	
	Phillips laundry	DD8	Washing machine		353453	Phillips	
	Siemens frost	TT1	refrigerator		645897	Siemens	
	Pitsos fridge	EE4	refrigerator		975681	Pitsos	
	Zanussi fridge	BB3	refrigerator		765893	Zanussi	
	Miele dish	AA2	dish washer		274638	Miele	
						- Success	
	< Previous					Harvester configuration saved succe	ssfuly

Figure 10-6: Save the data collection configuration

10.1.2 Acquisition through APIs

When the user chooses to configure an API for data acquisition, s/he is prompted to specify the settings of such an API connection. The user firstly selects the API response format between JSON and XML. The authentication details are defined, choosing among no authentication needed, bearer authentication and custom authentication.





EXCESS	Data Collection Jobs Datasets Search Models	About	🗘 🔀 Konstantinos Latanis 🗸
Configure Harve	ester: excess API test		X Cancel Save Configuration - Finalize Configuration
STEP 1 Setup Harvest Service			STEP 2 Test and Review Configuration
	Data Loading How do you plan to load your data to the platform?	DATA PROVIDER'S AVA Collect data from the APIs	ILABLE API provided by applications and systems of the data provider or from open APIs
	Response Format Select the format of the API response	SISON () XML	
	Authentication Details Details about the authentication policies of the API	• None O Bearer O C	ustom

Figure 10-7: Configure API connection (1)

The user also defines the API URL and the method (GET, POST, PUT) along with the necessary request parameters as dictated by the API URL. In case of POST or PUT methods, the query body of the API connection has to be specified. In addition, the API pagination is defined among the options of no pagination, offset pagination and page pagination. For offset and page options, the related request parameters are also described.

EXCESS	Data Collection Jobs Datasets Search Models	About			¢	K Konstantinos Latanis 🗸
Configure Harve	ester: excess API test			× Cancel	Save Configuration	✓ Finalize Configuration
STEP 1 Setup Harvest Service			STEP 2 Test and Review Configuration			
	Method, URL & Body ③ The method, URL and query body of the request.	GET	eathermap.org/data/2.5/weather?q=athens&appid=2904	ef18c9bea92b70b0e04f4	:602609	Ì
Pagination Select your API pagination options		♥ None ○ Offset ○ Pag	je			
	Request Parameters Any uri, query or body parameters that will be used on the API calls	PARAMETER	VALUE	ТҮРЕ	SENSITIVE	
		© q	athens	Query	2 1	
		② appid	290eef18c9bea92b70b0e04f4c602	Query	6	
				1	+ ADD QUERY PARAMETER	ļ
					Next >	

Figure 10-8: Configure API connection (2)

The user also describes the extra headers that may be needed for the realization of the API connection. Moreover, the retrieval settings are specified, as the user selects whether the data will be collected (a) once, by setting a specific date, (b) periodically, by setting a start and an end date along with a retrieval schedule depending on the selection of hourly, daily, weekly or monthly periodic collection or (c) every 60 seconds (polling), by setting a start and an end date.





EXCESS Data Collection Jobs Datasets Search Models About				🗘 K Konstantinos Latanis 🗸
Configure Harvester: excess API test			X Cancel Save	Configuration ✓ Finalize Configuration
STEP 1 Setup Harvest Service	STEP 2 Test and Revi	w Configuration		
Extra Headers Any extra header that needs to be part of the API calls	HEADER VALUE		SENSITIVE	
Retrieval Settings Select how offer you want to retrieval through the APP Until when?	Retrieve Once Periodic Retrieval (acc Retrieve from 21 September 20 Period Hourty Daily Schedule 1 12 C Res at 12:00 cmp day, tasis	rding to schedule) Polling (every 50 seconds) 1 to 30 September 2021 Veekly Monthly 0 or v 0 0 mor 11 Systember 2021 (UTC timeso	+ ADD SCHEDULE	
	Schedule 2 18 v 1 Runs at 1830 every day, starti) v 🖞	one applied)	

Figure 10-9: Configure API connection (3)

Moreover, the user selects how often the processing of the collected data will be carried out (immediately, every hour, every day).

EXCESS	Data Collection Jobs Dataset	s Search	Models	About						\$	K Konstantinos Latanis 🗸
Configure Harve	ester: excess API test								× Cancel	Save Configuration	Y Finalize Configuration
STEP 1 Setup Harvest Service						STEP 2 Test and R	eview Configu	ration			
				Period	Hourly	Daily	Weekly	Monthly		+ ADD SCHEDULE	-
				Schedule 1	12 Runs at 12:00	✓) every day, st	00 arting from 21 Se	♥ @ ptember 2021 to 3	0 September 2021 (UTC timezone a	applied)	
				Schedule 2	18 Runs at 18:31	♥) every day, st	30 arting from 21 Se	♥ 🗇	0 September 2021 (UTC timezone a	applied)	
	Processing How often should we process your of	data?		• Immediately	y 🔘 On an ho		🔵 On a daily	basis 🔿 On	a weekly basis		
	Error Handling Strategy				C Datas	5	aas (mustu) 20 a	and a			
	How should we handle any errors h	arvesting data?		U No action	U Ketry	5 tin	nes (every 30 s	econas)			
										Next >	

Figure 10-10: Configure API connection (4)

When the configuration of the API connection details is completed, the complete API response is presented according to the testing of the API connection. The user can choose whether the API response will be handled as a single record or as multiple records under a specific path and may add any additional static or dynamic parameters within the data. S/he may select which data elements of the API response will be further processed in the next stages of the EXCESS Data Management Platform and a preview of the selected actual data is displayed. The unselected data elements will be discarded and subsequently not be stored in the EXCESS Data Management Platform.





Configure Harvester: excess API test	X Cancel Save Configuration 🗸 Finalize Configuration
STEP 1 STEP 2 Entry Harvest Service Configuration	
Response Handling Hew should the response be handled? Image: Start of RECORD Each API response includes multiple records that appear under the selected path	
Store Additional Parameter within the Data Details about any static or dynamic parameters that should be added in each record/row. Add additional parameter as data	
API Response Selection The complete API response networkd when testing the API connection. The user networkd to select the concepts that are not selected will be discarded.	

Figure 10-11: Test API connection and review API response

10.1.3 Acquisition through Pub/Sub mechanisms

When the user chooses the Pub/Sub mechanism for acquisition of streaming data, s/he firstly defines the format of the data to be streamed (JSON or XML). Moreover, the user specifies the connection URL, the Kafka topic, the ID of the group and the SASL mechanism along with any necessary credentials.

EXCESS Data 0	Collection Jobs Datasets Search Models About				🗘 🕟 Konstantinos Latanis 🗸
Configure Harvester:	excess Pub/Sub test			X Cancel 🖺 Sav	e Configuration
STEP 1 Setup Harvest Service			STEP 2 Test and Review Configuration		
	Data Loading How do you plan to load your data to the platform?	STREAMING DATA Collect streaming data	FROM OWN PUBSUB MECHANISM ta from the PubSub mechanism that is available on your end		Â
	Format Select the format of the data you will stream to the kafka topic	• JSON 🔿 XML			
	Connection Details The connection details which will be used to collect your streaming data	Connection URL	tafka_URL:19092		
		Topic t	opic1		
		Group Id	group1		
		SASL mechanism	CRAM-SHA-512 V		
		Username	user1		
		Password			
				New X	

Figure 10-12: Configure Pub/Sub connection (1)

The user also defines until when the streaming data will be retrieved and how often they will be processed (every hour, every day).



EXCESS	Data Collection Jobs Datasets Search Models	About		¢	K Konstantinos Latanis V
Configure Harve	ester: excess Pub/Sub test			X Cancel Save Configuration	V Finalize Configuration
STEP 1 Setup Harvest Service			STEP 2 Test and Review Configuration		
		Password	•		^
	Retrieval Settings Until when you want to retieve data from Kafka topic?	Retrieve until 30 Se	eptember 2021		
	Processing How often should we process your data?	Every Hour C Every Da	у		
	Error Handling Strategy How should we handle any errors harvesting data?	No action O Retry	5 times (every 30 seconds)		
				Next 3	

Figure 10-13: Configure Pub/Sub connection (2)

When the configuration of the Pub/Sub mechanism details is completed, the complete Pub/Sub response is presented according to the testing of the Pub/Sub mechanism. The user may select which data elements of the Pub/Sub response will be further processed in the next stages of the EXCESS Data Management Platform and a preview of the selected actual data is displayed. The unselected data elements will be discarded and subsequently not be stored in the EXCESS Data Management Platform.

EXCESS Data Collection Jobs Datasets Search Models	About		🗘 🐧 Konstantinos Latanis 🗸
Configure Harvester: excess Pub/Sub test			🗙 Cancel 📓 Save Configuration 🐼 Hwater Configuration
STEP 1 Setup Harvest Service		STEP 2 Test and Review Configuration	
	Cafes Response Selection The comparison fails may be added and the balling the Cafes convertision. The and we are a locatify the cancels that alread be convertised. The concept that are not exclude well be abcreaded.	<pre> fullingE0*; "string", "exclusion_intring", "security intring", "security intring</pre>	
	Selected Office Response Somerary 4.5 and the office and the foldal Response that will be permanently alone.	<pre>table(ger) '12100', '1200','1210',' '1200','1200','1200',' '1200','1200','1200',' '1200','1200','1200',' '1200','1200','1200',' '1200','1200','1200',' '1200','1200','' '1200','1200','' '1200','1200','' '1200','1200','' '1200','','1200','' '1200','','1200','' '1200','','1200','' '1200','','1200','' '1200','','1200','' '1200','','1200','' '1200','','1200','','','','','','','','','','','','',</pre>	

Figure 10-14: Test Pub/Sub connection and review Pub/Sub response

The user can save the Pub/Sub configuration in order to revisit it at a later time or finalize it. In case of finalization of Pub/Sub configuration, the user may change later only specific Pub/Sub mechanism details in order to maintain the Pub/Sub response consistency.







Figure 10-15: Check selected Pub/Sub response summary and save Pub/Sub configuration

10.2 Data Mapping

After the completion of the Data Collection step, the Data Mapping step follows, as long as the user has chosen it during the initial configuration of the pre-processing steps of the data collection job. If the user does not select the mapping procedure at that point, then the uploaded data will be stored in the EXCESS Data Management Platform as a single object and analysis activities that need data mapping will not be doable.

At the first step of the data mapping process, the user selects the domain where the data belong to and any standard that the data comply to, while s/he also chooses which category the data refer to. The domain actually comprises the EXCESS Common Information Model and the categories that the user may select from are the main concepts of the Model.





EXCESS Data Collection Jobs Datasets Search Models A	bout					🗘 🕟 Konstantinos Latanis 🗸
Mapping for: excess test 4						
STEP 1 Info		STEP 2 Configuration			STEP 3 Review and Confirmation	
	Domain Main domain to which the da	sta refer to	EXCESS COMMON INFORMATION MODEL The Common information Model of the EXCESS Data M	inagement Platform.		
	Standards Basic information about the s compty	landards to which the data	NONE ODXML (1.0.0) SAREF (v3.1.1) SAREF (v3.1.2)	OPENADR (2.0) SAREF4ENER (1.1.2) IFC (4.1) USEF UFTP (1.01)		
	Category Main concept to which the dr	da wêr to	AUNE And Constrained of when, with candidate decidinal And or constrained on a when, with candidate decidinal Constrained Constrained	characteristics building a single et may be build or excluded, all en appropriate can splithing in a constraint of the splithing of the splithing of the splithing of the splithing splithing of the splithing of the splithing of the splithing splithing of the splithing of the splithing of the splithing splithing of the splithing of the splithing of the splithing of the splithing of the splithing of the splithing of the splithing of the splithing of the splithing	ectrical system. enter to provide various well as memory aduat in viorement, Ar entrification, and an ther powering electrical	

Figure 10-16: Select the EXCESS CIM, standard and category for mapping



Figure 10-17: Confirmation of EXCESS CIM, standard and category selections

Upon finalizing and confirming the aforementioned selections, the semi-automatic mapping predictions of the EXCESS Data Management Platform are performed and the matchings of the data elements of the collected dataset to the equivalent concepts of the EXCESS Common Information Model are presented along with a level of confidence. The user may review the mapping results and identify any data type mismatches. The reviewing of mapping results is facilitated by the filtering of results to predicted, corrected, unidentified, invalid or selected. In the left pane in the Data Model area, the user can view the previously selected category of the EXCESS CIM with its various concepts and by clicking on each of them s/he can see its description and data type, something that facilitates the manual mapping process, where necessary.





EXCESS Data Collection J	obs Datasets Search Models About							🗘 🕟 Kor	nstantinos Latanis 👻
Mapping for: excess test 4						× Cancel	4/2 Validate	Save Mapping	✓ Finalize Mapping
STEP 1 Info		STEP 2 Configuration			STEP 3 Review and Confirmation				
DATA MODEL	PLAYGROUND				All Predicted Correcte	d Unidentified Inva	alid Selected	MAPPING DETA	ILS
Q, Search	SOURCE DATA		CONFIDENCE LEVEL	COMMON DATA MODEL				Click on one o	or more fields in
 SmartAppliance brandName 	brand String		••••	brandName String × SmartAppliance > brandName				playgrou	nd to start
Se code	code String		•••••	code String × SmartAppliance > code					
Be id Be manufacturerName Be model	specs String		•••••	description String × SmartAppliance > description					
😥 name 🗰 nominalVoltage 🌆 relatedAggregatorPortfolio	identifier Number		••••	id String × SmartAppliance > id					
 relatedBuilding relatedBuildingFloor relatedBuildingSpace 	manufacturer String		••••	manufacturerName String SmartAppliance > manufacturerNa	×				
 relatedBuildingZone relatedEnergyConsumptionMea: relatedGateway 									
 relatedKeyPerformanceIndicator relatedProsumer 									
Do you think that something is missing? Let us know!									
ErandName STRING The name of the brand of an electric appliance, that is particularly useful where the name of the brand and the vendor differs									
< Previous		Click a field to select + Hold down Ctrl	and click to select multiple fields	Press Esc to clear selection					Next >

Figure 10-18: Review the mapping predictions

The user can view the details of a mapping in the right pane, by clicking on this mapping that is highlighted in blue, as well as its sample values under the Playground area. The user has to provide the measurement unit, in case a mapped concept has a numerical data type, so that the respective transformation to the baseline measurement unit of the EXCESS Common Information Model can be performed. In the same sense, in case a mapped concept has a datetime data type, the user has to specify the datetime format and the reference timezone of the data.

EXCESS Data Collection J	Kos Detasets Search Models About							🗘 K Konstantinos Latanis 🗸
Mapping for: excess test 4						× Ca	ncel 💠 Validate	Save Mapping 🗸 Finalize Mapping
STEP 1 Info		STEP 2 Configuration			STEP 3 Review and Confirmation			
DATA MODEL	PLAYGROUND	704E		Clear Selection	All Predicted Co	rrected Unidentified	Invalid Selected	MAPPING DETAILS
Q, Search SmartAppliance See IsrandName	brand Sting	• •		brandName Sting × SmartApplance > brandName				nominalVoltage
e code e description	code String	•	••••	code String × SmartAppliance > code				Select measurement unit Select measurement unit Milikeit Volt
 manufacturerName model 	specs String	•	••••	description String × SmartAppliance > description				Kilovolt P.U.
 name nominalVoltage relatedAggregatorPortfolio 	identifier Number		* ~	nominalVoltage Double × SmartAppliance > nominalVoltage				
 relatedBuilding relatedBuildingRoor relatedBuildingSpace 	manufacturer String	•	•••	manufacturerName String	-			
 relatedBuildingZone relatedEnergyConsumptionMea 								
 relatedGateway relatedKevPerformancelorficator poyou think that something is missing? Let us knowl 	SAMPLE VALUES Identifier 1353453 1645897 1975681 1765893 1274638 11							
BrandName STRING The name of the brand of an electric appliance, that is particulary useful where the name of the brand and the vendor differs								
< Previous		Click a field to select + Hold down Ctrl and clic	ck to select multiple fields + F	ress Esc to clear selection				Next 5

Figure 10-19: Define mapping details (1)

When the user selects one or more unidentified elements, s/he can also define a related concept pertaining to these elements. After choosing the desired related concept and providing the respective prefix, the user may set this related concept to continue searching for a manual mapping among more related concepts or request for a new prediction for the selected element(s) based on this specific related concept.





EXCESS Data Collection J	Obs Datasets Search Models About							🗘 K Konstantinos Latanis 🗸
Mapping for: excess test 4						× Can	cel 💠 Validate	Save Mapping 🗸 Finalize Mapping
STEP 1 Info		STEP 2 Configuration			STEP 3 Review and Confirmation			
DATA MODEL	PLAYGROUND SOURCE DATA		CONFIDENCE LEVEL	Clear Selection	All Predicted Con	rected Unidentified	Invalid Selected	MAPPING DETAILS
 SmartAppliance SmartAppliance 	brand String			brandName String × SmartApplance > brandName				Select concept ~ Select concept relatedAggregatorPortfolio
code ind	code String		•••••	code String × SmartAppliance > code				relatedBuilding relatedBuildingNoor relatedBuildingSpace relatedEneroxConceumotionMeasurements
manufacturerName model	specs String		•••••	description String × SmartAppiance > description				relatedGateway relatedKeyPerformanceIndicator relatedProsumer relatedSmartApplanceControlCiperation
se name Re nominalVoltage TelatedAggregatorPortfolio	identifier Number		Drag and drop a field here	SmartAppliance				relatedStatus
 relatedBuilding relatedBuildingFloor relatedBuildinoSpace 	manufacturer (Stiling)		Drag and drap a field here	SmartAppliance				
relatedBuildingZone relatedEnergyConsumptionMea								
 relatedGateway relatedKevØerformancelorficator Do you think that something is missing? Let us knowi 	SAMPLE VALUES Identifier "353453" (445097" '975661" "765093" "274636" "							
BrandName STEINS The name of the brand of an electric applance, that is particularly useful where the name of the brand and the vendor differs	manufacturer "Phillips" "Slemens" "Pitos" "Zenuss" "Miele" "							
< Previous		Click a field to select + H	old down Ctrl and click to select multiple fields •	Press Esc to clear selection				Next >

Figure 10-20: Define mapping details (2)

Once the new prediction is displayed for this element, the user may also see the related concept and its subconcepts in the Data Model area in the left pane.

EXCESS Data Collection J	obs Datasets Search Models About					🗘 🚺 Konstantinos Latanis 🗸
Mapping for: excess test 4					X Cancel 💠 Validate	Save Mapping 🗸 Finalize Mapping
STEP 1 Info		STEP 2 Configuration		STEP 3 Review and Confirmation		
DATA MODEL	PLAYGROUND SOURCE DATA	CONFIDENCE LIVE.	Clear Selection	All Predicted Corrected	Unidentified Invalid Selected	MAPPING DETAILS
 Building Building 	brand String	••••	brandName String × SmartAppliance > brandName			ы
🚾 actualNetArea	code String	•••••	code String × SmartAppliance > code			
constructionEndDate constructionMethod constructionStartDate	specs String	•••••	description String × SmartAppliance > description			
coolingWetBulb lescription documentationFiles	identifier Number	•••••	id String × SmartAppliance > relatedBuilding :	> id		
eavesHeight elevationOfRefHeight elevationOfferrain	manufacturer String		SmartAppliance > relatedbuilding >			
energyPerformanceCertification fireProtectionClass						
grossFloorArea be sationDecionDateTime Do you think that something is missing? Let us know!	SAMPLE VALUES kemtifier "353455" "645897" "975681" "765893" "274638" "					
ElevationOfRetHeight [DOUBLE] Bevation above sea level of the reference height used for all storey elevation measures, equals to height 0.0. It is usually the ground floor level.						
< Previous		Click a field to select • Hold down Ctrl and click to select multiple fields •	Press Esc to clear selection			Next >

Figure 10-21: Navigate to related concepts and subconcepts

The user may also delete any mapping predictions to select manually concepts that match better to the data elements or may match any initially unidentified data elements to suitable concepts of the EXCESS Common Information Model. The manual mapping is performed by dragging and dropping a concept from the Data Model area to an unmapped data element in the Playground area. In case any unidentified elements are not mapped, they will be discarded from the rest of the steps of the data collection job and eventually will not be stored in the EXCESS Data Management Platform.





EXCESS Data Collection 3	obs Datasets Search Models About					🗘 🕟 Konstantinos Latanis 🗸
Mapping for: excess test 4					X Cancel 💠 Validate	Save Mapping 🗸 Finalize Mapping
STEP 1 Info		STEP 2 Configuration		STEP 3 Review and Confirmation		
DATA MODEL	PLAYGROUND		Clear Selection	All Predicted Corrected	Unidentified Invalid Selected	MAPPING DETAILS
Q, Search	SOURCE DATA	CONFIDENCE LEVEL	COMMON DATA MODEL			TITLE
(10) nominalVoltage	brand String	••••	brandName String × SmartAppliance > brandName			stateOfCharge REFERENCE MEASUREMENT UNIT
 relatedAggregatorPortfolio relatedBuilding relatedBuildingFloor 	code String	•••••	code String × SmartAppliance > code			Select measurement unit
 relatedBuildingSpace relatedBuildingZone relatedEnergyConsumptionMea 	specs String	•••••	description String × SmartAppliance > description			
relatedGateway relatedKeyPerformanceIndicator relatedProsumer	identifier Number	* ~	stateOfCharge Double × SmartAppliance > stateOfCharge			
 relatedSmartApplianceControlO relatedStatus 	manufacturer String		SmartAppliance			
serialNumber stateOfCharge set type						
M typicalEnergyConsumption	SAMPLE VALUES					
Do you think that something is missing? Let us know!	identifier "353453" "645897" "975681" "765893" "274638" "					
ElevationOfRefHeight [DUBLE] Elevation above sea level of the reference height used for all storey elevation measures, equals to height 0.0. It is usually the ground floor level.						
< Previous		Click a field to select • Hold down Ctrl and click to select multiple f	ields • Press Esc to clear selection			Next >

Figure 10-22: Define manual mappings

When the user proceeds to the final mapping stage, s/he can see an overview of the mapped and unidentified concepts and finalize the mapping configuration, which is saved in the configuration file. Upon finalization and confirmation, the mapping process cannot be edited anymore and the data collection job continues with the rest of its steps.

10.3 Data Cleaning

After the completion of the Data Mapping step, the Data Cleaning step follows, as long as the user has chosen it during the initial configuration of the pre-processing steps of the data collection job. At the first step of the data cleaning process, the user can view all the mapped concepts of the ingested dataset that have proceeded to the cleaning step. By clicking on any of them, the user can view their sample values, while s/he can make (or clear) multiple selections of these fields manually or by data type.

EXCESS Data Collection Ixide Datasets Search Models About	💭 📧 Konstantinos Lataris 🗸
Cleaning for: excess test 4	X Cancel 📓 Same Clauring 😪 Finalize Clauring
STP 1 Configuration	STIP 2 Reveis and Report
Cleaning constraint securiton order information Mandatory constraints will be executed first Constraints Will be executed second All other constraints will be executed in the order provided	×
FIELDS Cear Selection All String Integer	RULES & CONSTRAINTS
brandName Smoot Smothgstras - bondhane	No cleaning rules and constraints have been defined for the selected field Add a constraint
code Strang Smartgatines - code	
cellsInSeriesCount Network Smartapsines > materDayPerformancembating > resterBatting > cellsinSeriesCount	
SAMPLE VALUES	
ominospience - energenenee "Phillips laundy" "Stemens frost" "Pitsos fridge" "Zanussi fridge" "Miele dish"	
Click a field to select - Hold down (2011) and click to select	ct multiple fields - Press [BE] to clear selection [end 3

Figure 10-23: List of mapped concepts available for cleaning rules



By selecting one or more fields, the user is allowed to set the desired cleaning rules according to the data type of the selected fields. For each field, multiple cleaning rules may be applied. The user may also save the cleaning configurations to revisit at a later time.

EXCESS Data Collection Jobs Datasets Search Models About	💭 🕟 Konstantinos Latanis 🗸
Cleaning for: excess test 4	兴 Catool 📓 Sine Catoolig 📝 Hindler Calcular
ST# 1 Configuration	SHP 2 Review and Report
Cleaning constraint securities erder information Mandatory constraints will be executed first Constraints World ender Infold PMI the executed second All other constraints will be executed in the order provided	×
FIELDS Cear Selection All String Integer	RULES & CONSTRAINTS
brandName Exces Smolegoines / Bradhane	Contrabut See Contant V
code State	Regue Depreson Pattern Constraint Urique Constraint Creas-Fed Usidant Constraint
cellsInSeriesCount INNEXE Smallpatines > reasestig/informacembalang > restartisting > celsrideresCount	Foregr-agy Constant
SAMPLE VALUES Smallparter - I baseNews This as years - teams har - Tables froat - Tables froat - Main ear	

Figure 10-24: Set a cleaning rule (1)

For each cleaning rule, the user can specify its details and define how the outlier values will be handled by the Data Collection component. These outliers can be dropped from the dataset or replaced with other values selected by the user through a list of options offered depending on the data type of the field to be cleaned (e.g. replacement with a specific default value, the most frequent value of the field, the maximum value of the field, etc.). The user can edit or delete any created cleaning rule and s/he can also alter the execution order of cleaning rules for a specific field.

Cleaning for: excess test 4			X Cancel Save Cleaning V Finalize Obaning
STEP 1 Configuration		STEP 2 Review and Report	
Cleaning constraint execution order information • Mandatory constraints will be executed first • Constraints will collier and or DRDP will be executed second • All other constraints will be executed in the order provided			×
FIELDS	Clear Selection All String Integer	RULES & CONSTRAINTS	
brandName String		CONSTRAINT	
SmartAppliance > brandName		Mandatory Constraint	
		Field values must not be null	
code String SmatApplance > code		Attention! The field values you define may have been set to null during a transformation in the Mapping step	
		OUTLIERS RULE	
cellsInSeriesCount Integer		Replace with default value	×
smanuupphanke 7 reaebukgyrenumankenukalug 7 reakebbaueryg 7 keisinbenebukunk			
		DEFAULT VALUE	
		New brand Name	
			Cancel Create constraint
SAMPLE VALUES SmirtLeptilance > brandhame			
"Philips laundry" "Siemens frost" "Pitsos fridge" "Zanussi fridge" "Miele dish" "			
	Click a field to select - Hold down Ctrl and click to select	t multiple fields • Press Esc to clear selection	Next >

Figure 10-25: Set a cleaning rule (2)





EXCESS Data Collection Jobs Datasets Search Models About		👃 🕐 Konstantinos Latanis 🛩
Cleaning for: excess test 4		🔀 Casel 📓 Sne Cheming 🔽 India: Casaing
STEP 1 Configuration		STEP 2 Review and Naport
Cleaning constraint execution order information Mandatory constraints will be executed first Constraints will be executed in the order provided All other constraints will be executed in the order provided		×
FIELDS	Clear Selection All String Integer	RULES & CONSTRAINTS
brandName String Smitheolance -> brandName	1 Cleaning Rule Defined	Field values must not be null, otherwise they will be replaced by New Brand Name.
		+ Add another constraint
code String SmartApplance > code		
cellsInSeriesCount Introdu SmartApplance > related/op/InformanceIndicator() > related/setieny() > cells/nSeriesCount		
SAMPLE VALUES Smithgplance > brandhame		
"Philips laundry" "Siemens frost" "Pitsos fridge" "Zanussi fridge" "Miele dish" "		
(5d)	field to select a Hold down Ott, and click to selec	multiple fields a Press TWP to clear selection

Figure 10-26: Set a cleaning rule (3)

As soon as the user proceeds to the final cleaning stage, s/he can see an overview of the assigned cleaning rules as well as the fields that will not undergo the cleaning process and finalize the cleaning configuration, which is saved in the configuration file. During the data cleaning process, the execution order of the assigned cleaning rules is the following: (a) Mandatory constraints are executed first, (b) Constraints with "drop" outlier rule are executed second, (c) All other constraints are executed in the order provided by the user. Upon finalization and confirmation, the cleaning process cannot be edited anymore and the data collection job continues with the rest of its steps.

10.4 Data Anonymization

After the completion of the Data Mapping or Data Cleaning step, the Data Anonymization step follows, as long as the user has chosen it during the initial configuration of the pre-processing steps of the data collection job. At the first step of the data anonymization process, the user can view all the mapped concepts of the ingested dataset that have proceeded to the anonymization step, while by clicking on any of them, the user can view their sample values. By default, all fields are initially insensitive.





EXCESS Data Collection Jobs Datasets Search Models About	🗘 🕟 Konstantinos Latanis 🗸
Anonymisation for: excess test 4	X Cancel 🔛 Save Anonymisation 🗸 Finalize Anonymisation
STEP 1 Configuration	STEP 2 Review and Report
FIELDS Clear Selection All Insensitive Identifier Quasi-Identifier Sensitive	ANONYMISATION RULES
brandName String SmartAppliance > brandName	INSERSITIVE This field will remain unchanged and it will not have any effect on the anonymisation algorithm. Edit
code [String] SmartApplance > code	
cellsInSeriesCount Integer SmartApplance > relatedReyPerformanceIndicator() > relatedBattery() > cellsInSeriesCount	
SAMPLE Smart/Appliance > brandName "Phillips laundry" "Siemens frost" "Pitsos fridge" "Zamussi fridge" "Miele dish" ""	

Figure 10-27: List of mapped concepts available for anonymization rules

By selecting a field, the user is enabled to set an anonymization rule with its details depending on the data type of the field. The user may (a) maintain a field as insensitive, thus no anonymization rule will be applied, (b) set the field as identifier, where the respective column will be dropped, (c) set the field as quasi-identifier, where the appropriate generalization method will be applied according to the field data type (masking for string data type and interval or numerical group for numerical data type) and (d) set the field as sensitive, so that the anonymization algorithm will protect these field values by generalizing the quasi-identifiers. The user has also the option to filter the fields based on the aforementioned four categories of assigned anonymization rules. Especially for the generalization method of quasi-identifiers, the user is enabled to see an example of the generalization levels that may be applied based on the anonymization algorithm. The user can edit any of the created anonymization rules and also save the anonymization configurations to revisit at a later time.

EXCESS Data Collection Jobs Datasets Search Models About	💭 🕓 Konstantinos Latanis 🗸
Anonymisation for: excess test 4	🗙 Cancel 🔛 Save Anonymisation 🗸 Risalize Anonymeiaador.
STEP 1 Configuration	STEP 2 Review and Report
FIELDS Clear Selection All Insensitive Identifier Quasi-Identifier Sensitive	ANONYMISATION RULES
brandName String Insensitive SmartApplance > trandName Insensitive code String Insensitive SmartApplance > code Insensitive cellsInSeriesCount Integer Insensitive SmartApplance > relatedKyPerformanceIndicator[] > relatedKitey[] > cellatiSeriesCount Insensitive	ANONVMISATION TYPE Inservative Select anonymination type Inservative Udentifier Quasi-dentifier Senvative
SAMPLE SmartApplance > brandName "Phillips laundry" "Siemens frost" "Pitsos fridge" "Zanussi fridge" "Miele dish" "	
	Next

Figure 10-28: Set an anonymization rule (1)





EXCESS Data Collection Jobs Datasets Search Models About	🗘 🐧 Konstantinos Lataris 🗸
Anonymisation for: excess test 4	🔀 Cancel 🔛 Save Antergreisation 🛹 Triadice Antergreisation
STEP 1 Configuration	STEP 2 Review and Report
FIELDS Clear Selection All Insensitive Identifier Quasi-Identifier Sensitive	ANONYMISATION RULES
brandName String Insensitive SmartApplance > brandName	ANONYMISSION TYPE Quasi-Identifier v
code [String] Internitive SmartApplance > code	Onconstantion we mode The field values will likely be obscured by the masking character starting from right to left. The anonymisation algorithm will try to hide as few characters as possible.
cellsInSeriesCount Integer Internitive smartApplance > relatedBattery[] > cellsInSeriesCount	Massing Character Padding Character
SAMPLE	MANDLE NULL VALUES O Keep O Replace with empty string
Smart/gbland > brankhane "Philips laundry" "Siemens frost" "Pitos fridge" "Zanussi fridge" "Miele dish" **	Cancel Apply
	Next 2

Figure 10-29: Set an anonymization rule (2)

EXCESS Data Collection Jobs Datasets Search Models Allow									۵ 🖪	Konstantinos Lataris 🐱
Anonymisation for: excess test 4							× 4	incel 🕒 Save A	inonymisation	
HIP 1 Carligation	STOP 2 Review and Report									
FIELDS Daw Selection at Insertitive Meetifier Qual-Meetifier Sentitive	ANONYMISATI	ON RULES								
Interdition Colorada Colorada Colorada Exclusion Colorada	USUAL ADDITION COLLEMPTION C									
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	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 5
	Senero host	###Siemens fros?	###Siemens from	###Sement from	###Siemens (****	###Sigment name	###Senergement	###Sectes	###Siema*****	APPSign*taxons #
	Pittins fridge	aaaDitses hidg*	###2isos hid**	seatings form	###Pittos fr****	asaDitata Press	###Ditsos ++++++	\$\$\$0 ₁₂₀₀	###21tto******	###713****** #
	Zenussi fridge	##Canussi Hidg*	##Zerussi frid**	##Zenizsi fritte	**2*****	442 process (*****	**2274251 *****	##Zancos/*****	##Zanut3******	442anus******* 4
	Male dish	annenstitiele dir	######Uld# 5**	######\$\}\2\4 C***	#######//idia ****	######\\{4\a ⁴⁴⁴⁴⁴	Addadd)/(2)*****	######################################	######!!!******	danaa (),
SAMPLE Southglober - bandhaw "Billing bandy "Sawan here" "Bana here" "										

Figure 10-30: Set an anonymization rule (3)

As soon as the user proceeds to the final anonymization stage, s/he can see an overview of the anonymization rules as well as the fields that will remain insensitive and finalize the anonymization configuration, which is saved in the configuration file. The user may provide the acceptable information loss threshold that if it is exceeded, the anonymization process will fail since the data will be destroyed upon the designated threshold. Moreover, s/he can define the level of k-anonymity, which is the data anonymization algorithm. Upon finalization, the anonymization process cannot be edited anymore and the data collection job continues with the storage process.





EXCESS Data Collection Jobs Datasets Search Models About	💭 🕟 Konstantinos Latanis 🗸
Anonymisation for: excess test 4	🔀 Cancel 🔛 Save Anonymisation 🗸 Finalize Anonymisation
STEP 1 Configuration	STEP 2 Review and Report
Acceptable Information Loss Threshold: 70% d	Anonymisation Algorithm: k-anonymity (k=2) 🖉
QUASI-IDENTIFIERS	
brandName Strong SmartApplance > brandName	Masking
SENSITIVES	
cellsInSeriesCount Integer > cellsinSeriesCount	
INSENSITIVE	
code string	
< Previous	

Figure 10-31: Summary of assigned anonymization rules

10.5 Data Storage and Update

As long as a dataset has undergone all the designated by the user pre-processing steps, it arrives at the Data Storage step, where the data are finally loaded in the EXCESS repositories.

The user is prompted to define the name and the description of the dataset and upon finalization, the data are finally stored in the repositories of the EXCESS Data Management Platform, while the data collection job is completed.

EXCESS Data Collection	Jobs Datasets Search Models About		🗘 🧭 Konstantinos Latanis 🗸
Data Loading for: excession	st 4		× Cancel Finalize Dataset
	Destination How do you want your data to be handled?	REW DATASET Create a new dataset and load the processed data	
	Dataset Information Enter a title and a short description for your asset. You will be able to change these once the asset is created	NAME test dataset DESCRIPTION	
		This is a text dataset.	

Figure 10-32: Define name and description of dataset





EXCESS Data Collection Job	Datasets Search Mudels About	🖉 💽 Korstantinos Latanis 🗸
Data Loading for:		🗙 Cancel 🗸 Houter Daramer
	Descention: Concention: The note of a start is due to show the two species with the start is the two species wi	

Figure 10-33: Completion of data collection job and data stored in EXCESS Data Management Platform

EXCESS Data Collection J	obs Datasets Search M	lodels About			🗘 🔀 Konstantinos Latanis 🗸
Data Collection Jobs					+ Create
	excess test 4 . Konstantinos Latanis 🖄 Update	d on Sep 22, 2021		COMPLETED :	
	Harvester Loader test data collection job	> Mapping 🥥	> Cleaning 🥥	> Anonymiser 🥥	
	excess API test . Konstantinos Latanis 🗇 Update	d on Sep 21, 2021		CONFIGURATION: HARVESTER	
	excess Pub/Sub test 	d on Sep 21, 2021		CONFIGURATION: HARVESTER	
	excess test 3 . Konstantinos Latanis 🖾 Update	d on Sep 21, 2021		COMPLETED	
	excess test 2 . Konstantinos Latanis 🖄 Update	d on Sep 21, 2021		CONFIGURATION: HARVESTER	
	excess test . Konstantinos Latanis 🗇 Update	d on Sep 14, 2021		CONFIGURATION: MAPPING	

Figure 10-34: Data collection job completed

In the case of file uploading, the user may update a dataset by choosing its previously executed data collection job and adding a new file with the same data structure in the data collection step. The already created configuration file for this job with all its previously defined pre-processing rules will be used and the dataset will be finally appended with the data of the new file. The data update is not feasible only in case specific cleaning rules had been assigned in the previously executed data collection job or the initial dataset had undergone the anonymization process.





EXCESS Data Collect	on Jobs Datasets Search Models About		🗘 🔀 Konstantinos Latanis 🗸
Configure Harvester: exce	ess test 3		X Cancel
STEP 1 Setup Harvest Service		STEP 2. Test and Review Configuration	
	Data Loading How do you plan to load your data to the platform?	FILE UPLOAD Direct file upload (CSV, ISON, XMA)	
	Format Select the format of the file you will use	CSV SISON XML Other	
	Sample Upload Upload a sample of your data to be used in next steps	Sample uploaded and saved	
	Uploaded Files Files already uploaded	C EXCESS_occupancy.json	
	Upload Additional File(s) Upload additional file(s) to be processed (if in csv, json, xml format).	BROWSE DEXCESS_accupancy_new/ion 16.3 KB	

Figure 10-35: Update a dataset (1)

EXCESS Data Collection	on Jobs Datasets Search Models About				¢ (K Konstantinos Latanis 🗸
Configure Harvester: exce	ss test 3				× Cancel	Update Configuration
STEP 1 Setup Harvest Service			STEP 2 Test and Review Configuration			
	ADDED FILES D EXCESS_occupancy_new.json Data Sample The details of the data sample that was uploaded	f "Building ID": "Build "Building Descriptio "Space ID": 50", "Space Description" "Space Exerciption" "Space Type"; Teals	ling_1", n": "A building which contains 2 spaces, ked", : "Residence for 1 occupant", dentialOwn", cupants": 1.	16.3 KB × both residencies and offices.",		
	2 Perior	"Occupant Name": "BehaviorID": "B_Th "BehaviorID": "B_Th "Need_ID": "5", "Need Type": "Ther "maximum tempera "Meeting ID": "M1",	, CoccupantO150°, erm1°, n°: "When temperature is outside the th nal", nure': 95,	ermal comfort range set to 22.5 deg C [*] ,		

Figure 10-36: Update a dataset (2)

10.6 Metadata definition

When a data collection job is completed, the stored dataset is displayed in the list of datasets as incomplete because its metadata are needed to be defined by the user in order to make it available to the EXCESS Data Management Platform.



Figure 10-37: List of datasets

By clicking on this dataset, the user may see its overview and data structure, while s/he is prompted to fill in its metadata.

E×CESS	Data Collection Jobs Datasets Search Models	About			¢ (K Konstantinos Latanis 🗸
test dataset v1 ≗ Konstantinos Latanis	INCOMPLETE Durated 14 hours ago Domain: EXCESS Common Information I	Model 🖞 Categories: SmartAş	opliance, <i>Building, KeyPerform</i>	anceIndicator		
OVERVIEW			DATA STRUCTURE			
	Please fill in the asset's metadata in order to make the asset			Edit asset details $ ightarrow$	Í	
	Description and Tags A brief overview that acts as an account of the data asset's contents and a list of keywords and/or arbitrary textual tags associated with the data asset by its data provider.	This is a test dataset.				
	Distribution Details Information regarding the availability and access to the specific data asset	Volume ① 45 records	Type ③ Text	Format ③ JSON	Velocity () Batch	
		Accessibility ① Through an API		Accrual Method ③ By uploading updated/rev	vised file(s)	
		Accrual Periodicity ③ Provider-dependent				

Figure 10-38: Overview of dataset

By clicking on the edit option, the user may define the general information of the dataset and its distribution, temporal and spatial details. Moreover, the licensing and access policy information of the dataset are specified, indicating which users can have access on this dataset.

EXCESS Data Collection Jobs Datasets Search Mod	els About	🔔 🧭 Konstantinos Latanis 🗸	~
Edit Asset Details		× Cancel Save	re
General Information General information about the profile of the specific data asse	TITLE The name of the data asset by which it can be easily identified. test dataset DESCRIPTION A brief overview that acts as an account of the data asset's contents. This is a test dataset. Description A lot of beyroords and/or arbitrary testual tags associated with the data asset by its data provider. Add tags ERFENCE The esternal data assets (only Other Files) to which a data asset is linked. Select: reference		*

Figure 10-39: Edit dataset metadata (1)



EXCESS	Data Collection Jobs Datasets	Search	Models	About	¢	K Konstantinos Latanis 🗸
Edit Asset Deta						X Cancel
				TEMPORAL RESOLUTION UNIT The Requercy of Acquiring new data from the same data source (e.g. as part of a dynamic process from a system/control/sensod. Select temporal resolution unit * Separation of the same data allowing to distinguish different spaces using the data; either in the data allowing to distinguish different spaces using the data; either in them of advant space/ground area (e.g. room, zone, building, control set) as a safe data by sensor/sensor networks. Select spatial resolution unit *		
	Licensing Information Information regarding the license and i which a data asset is made available	ts associated to	erms under	ACCESS LEVEL The devind violating of a data asset, i.e. Confidential (not to be shared), Private (b be shared), and the share of the sh		
	Access Policy Define who has and doesn't have acces	is to this data		No license access level has been chosen yet for this asset		ļ

Figure 10-40: Edit dataset metadata (2)

Upon saving the metadata selections, the dataset is displayed as available in the list of datasets and can be used for analysis and other purposes in the EXCESS system.

EXCESS	Data Collection Jobs Datasets Search Models About	¢	Konstantinos Latanis 🗸
Datasets			
	test dataset Å Konstantinos Latanis 🗇 Updated on Sep 23, 2021	AVAILABLE	
	excess test 3 Konstantinos Latanis Dupdated on Sep 22, 2021	INCOMPLETE	

Figure 10-41: Dataset available with completed metadata



11 Conclusions

This deliverable has documented the activities of the Task 3.2 "Interoperable Data Management Framework" towards the design and development of the EXCESS Data Management Platform and the elaboration of the EXCESS Common Information Model. The EXCESS Common Information Model comprises the common language for all the datasets residing in the EXCESS Data Management Platform so that they are eligible for analysis and other purposes. The methodology for the elaboration of the EXCESS Common Information Model has been presented, regarding the provision of sample datasets by the demo site partners, while the related building and energy standards that have been used as a basis for the model elaboration have been described. In this sense, the concepts of the EXCESS Common Information Model that is encapsulated in the EXCESS Data Management Platform have been provided. Moreover, the different components that comprise the EXCESS Data Management Platform have been described, namely the Data Collection component, the Data Mapping component, the Data Cleaning component, the Data Anonymization component, the Data Storage component and the User Management service. The functionalities and the related technologies that have been used for their implementation have been provided. In addition, a comprehensive guide for the use of the different components of the EXCESS Data Management Platform is presented, showing the corresponding collection, pre-processing and storage tasks.

The deliverable D3.2 has presented the first release of the EXCESS Data Management Platform and the EXCESS Common Information Model. In M32 of the project, an updated version of the deliverable will be elaborated, including all the refinements and updated functionalities of the final release of the EXCESS Data Management Platform along with the updated EXCESS Common Information Model based also on the feedback collected by the demonstrators during the initial operation of the buildings of the demo sites.



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Annex: Data Collection Exercise

Finnish demo site:

0.	asa Description	Data Descri	peion		Dies Asset Presents									Data Asset Avalabley								Types of a				lysis Relevance to								
																	Dependency /	D	Nata Asset				Update				currently				specific			
Dataset ID	Data Acces Titla	Description	Date of Row Last	Makama	Marinter	Tumo	Format	Melenity	Historical Data	Temporal	Rential Courses	Language	Relevant	Magazitu	Temporal	Spatial	Linking to Other Data	Asset Avi	ailable from	Data Asset	Accessibility	Frequency of	Strategy	Documentation	Belever	Need for	conducted on	Accuracy	Completioner	e Timelinese	demonstration	Importance	Patienale	
Children ID	Carls Assoc Title	Description	opume	Totalite	variacy	1 3900	r or man	velocity	Aranashiy	coverage	opana coverage	Language	Standar Ga	renacity	[I ne nemporar	[I THE SQUEEN	Jources Of	-	Jurany	FIGHAE	intering a	opunes		Documentation	Incompensar (not to be shared	Anonymaanon	Cista	JANEAR LINE OF	Companying		acuttona	importance	PORT/CRIME	1
[Unique identifier												fe a Familia	[List the	(Berr Des	"granularity" of	"granularity" of				Des services of the	Thereast All An	Real-time, Every		The documentation of the	e at all) / Proprietary (to be		la a Combita	correctness an	d (Degree to which		Plow relevant a dat	Plowcritical a data	(Freeboorthes	
convention		A brief description of the data asset	- The date of the last	(X GBs / records /	/ [Stuctured/							Finnish, French,	standards to which	processed.	per minute /	at datrict /	[YON, If Y, list the			data asset	downloadable file,	Daily, Weekly,	(Append new data /	the location and the name	e licensing with the demonstrator	Y/N depending on whether	analysis for,	whether the data	set sufficient in sco	e, (Howlong a data	specific demo site,	demonstrator,	reasons for	
"Country_Partner	-	At least 2-3 lines to give an overvie	w update of this row in the	transactions per	Unstructured /	[Text / Image.	/ (cav, am) jaon	(Real-time, Near				Dutch, German,	a data azzet	Processed Data	hour/day/	zone/building	other sources or The na	me of the		provider in	Az databaza	Monthly, Yearly,	Replace existing	of the file in the EXCESS	partnerz) / Privale (it) be	the data asset contains	Predictive analytics	is effor-free,	depth, Ranked	f asset remains up	Ranked 1 (Los) - 5	Ranked 1 (Low) - 5	Importance	0
LM_MINO/	The the or the data acces	or the data	specific spreadsneer	nour/aisy/monin	V Semi-structured	(Celer)	cener/	rota-crite, datchy	Inni	pron ra/	(LOCBEONE)	Englan. J	compensy	11160	monery	/ area seven	coastery data as	ser owner	Irng	EXCESS	extract, clinely	anen	data / othery	леровлогуу	snaned wen appropriate	sensitive or personal data;	101-1	Founded 1 (Lose)	- 5 (Low - 5 (righ	V ID-DBBV	(/igt()	prigesy	Anong	Commerces
Energy produc	tion & delivery system							-																					-					
EM1.1	Energiamittari	Kamstrup MC603 UF15 DN50	24-02-21			Float	CSV	Real-Time			LJH = heat distribution room	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 4		
EM1.2	Energiamittari	Kamstrup MC603 UF3.5 DN25	24-02-21			Float	CSV	Real-Time			ШH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 4		
EM2.1	Energiamittari	Kamstrup MC603 UF15 DN50	24-02-21			Float	CSV	Real-Time			ШH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 4		
EM2.2	Energiamittari	Kamstrup MC603 UF3.5 DN25	24-02-21			Float	CSV	Real-Time			ШH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N				_		5 4		
EM4.1	Energiamittari	Kamatrup MC603 UF25 DN65	24-02-21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 4		
ENW.2	Energiamittari	Kamarup MC603 UF25 DN65	2402-2			Float	Cave	Real-Time				Finish		Power Docent			D45 &	TAD							Proprietary/Private Proprietary/Private	N				-		6 A		
POF	Chargerman		24.02.21			Float	CSV	Real-Time			Lati	Finnish		Raw			BASA	TAS							Proprietary/Private	N			_			5 5		
PE4	PAINELÄHETIN	HK Instruments PTL-Cool-6-V	24-02-21			Float	CSV	Real-Time			ШΗ	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
PE1	PAINELÄHETIN	HK Instruments PTL-Heat-6-V	24-02-21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE1.1	LÄMPÖTILA-ANTURI	Produal TEAT NTC 10-80	24-02-21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE1.2	LÂMPÔTILA-ANTURI	Produal TEAT NTC 10-50	24-02-21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
IE1.3	LAMPOTILA-ANTURI	Produal TENA NIC 10-C	24-02-21			Float	CSV	Real-Time			LJH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N				-		5 5		
TE15	LAMPOTILA-ANTORI	Produal TEAT NTC 10-C	2402-21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N			-			5 5		
TE1.6	LÄMPÖTILA-ANTURI	Produal TEAT NTC 10-80	24-02-21			Float	CRV	Real-Time			LH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE2	LÄMPÖTILA-ANTURI	Produal TEU NTC 10	24-02-21			Float	CSV	Real-Time			Ukoseinä = external wal	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE3.1	LÄMPÖTILA-ANTURI		24-02-21			Float	CSV	Real-Time			LVV1.1 = DHW storage	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE3.2	LÄMPÖTILA-ANTURI		24-02-21			Float	CSV	Real-Time			LVV1.2	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE3.3	LAMPOTILA-ANTURI		24-02-21			Float	CSV	Real-Time			LVV2.1	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
IE3.4	LAMPOTILA-ANTURI		24-02-21			Float	CSV	Real-Time			LVV2.2	Finnish		rcaw			BAS &	TAS							Proprietary/Private	N						5 5		
TE3.6	LAMPOTILA-ANTURI	Produal TENA NEC 10-C	2402-21			Float	CSV	Real Time			LV II NOT Weber	Finnish		Raw			BAS &	TAS							Proprietary/Private	N			-	-		5 5		
TE3.7	LÄMPÖTILA-ANTURI	Produal TENA NTC 10-C	24-02-21			Float	CRV	Real-Time			LV	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE3.8	LÁMPÓTILA-ANTURI	Produal TENA NTC 10-C	24-02-21			Float	CSV	Real-Time			LVK	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.11	LÄMPÖTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time			ШH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.12	LÄMPÖTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.21	LAMPOTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.22	LAMPOTILA-ANTURI	TE25 NTC10k T150 050 06 5m	24-02-21			Float	CSV	Real-Time Real-Time			LJH	Finnish		Raw			BAS &	TAS							Proprietary/Private Proprietary/Private	N						5 5		
TE4.24	LAMPOTI A ANTI RI	TE25 NTC10k T150 050 06 5m	2402.21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.31	LÄMPÖTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time			LH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.32	LÄMPÖTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time			LIH	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.33	LÄMPÖTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time				Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.34	LÄMPÖTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time				Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.41	LÂMPÔTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time			Kaivot = energy well	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
1E4.42	LAMPOTILA-ANTURI	TF25 NTC10k T150 050 06 5m	24-02-21			Float	CSV	Real-Time			Kavot	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.45	LANPOTEA ANTON	TE25 NTC 10k T150 050 06 5m	2402-2			Float	Cave	Real-Time			Kolust	Finish		Power Document			D45 &	TAD							Proprietary/Private Proprietary/Private	N			-	-		6 6		
TE4.45	LÁMPÓTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CAV	Real-Time			Kaivot	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TE4.46	LÄMPÖTILA-ANTURI	TF25 NTC10k T150 050.06 5m	24-02-21			Float	CSV	Real-Time			Kaivot	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
EHP1	Electricity, heat pump 1		24-02-21			Float	CSV	Real-Time			Technical room	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
EHP2	Electricity, heat pump 2	formal an annual fi	24-02-21			Float	CSV	Real-Time			Technical room	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
Er_j	Electricity, circulation pum	rps (bbai or separate I)	2402-21			Pibet	Cav	Possi-Time			Nechnic al room	Prinsi		r.ww			DHD &	TAS							Proprietary/Private	N				-				
Air conditionin	ie system (not fully describe	ed. in planning phase), from AH	U vv:																															
QV_yy	based on dp)		24-02-21			Float	CSV	Real-Time			AHU, air handling unit, centra	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
EAC_yy	conditioning/AHU		24-02-21			Float	CSV	Real-Time			AHU, air handling unit, centra	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
TSA_yy	Supply air temperature		24-02-21			Float	CSV	Real-Time			AHU, air handling unit, centra	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
IEXI_yy	Exit air temperature		24-02-21			Float	CSV	Real-Time			AHU, air handling unit, centri	Finnish		Raw			BAS &	TAS							Proprietary/Private	N				-		5 5		
IWADIE_YY	wase at emperature		2402-2			Pibet	Cav	Poese - Time			Anu, ar nanding unit, centra	Pinish		ruw.			D45 &	TAS							Proprietary/Private	N			-					
Measurements	in apartments, xx indicatin	ng apartment number (not fally	described, in planning	nhase):																														
TR_xx	Room air temperature		24-02-21			Float	CSV	Real-Time			Apartment	Finnish		Raw			BAS &	TAS							Proprietary/Private	Y						5 5		
RHU_xx	Room air humidity		24-02-21			Float	CSV	Real-Time			Apartment	Finnish		Raw			BAS &	TAS							Proprietary/Private	Y						5 5		
CO2_xx	Room air CO2 level		24-02-21			Float	CSV	Real-Time			Apartment	Finnish		Raw			BAS &	TAS							Proprietary/Private	Y						5 5		
THOSE I_XX	Hoom air temp setpoint	and also for	24-02-21			Float	CSV	Real-Time			Apartment	Finnish		Raw			BAS &	TAS							Proprietary/Private	Y						5 5		
000.0	Occupancy (if possible, C)	C2 indication occupancy too?)	2402-21			Boolean	CSV	Real Time			Apartment	Finnish		Raw			BAS &	TAS							Proprietary/Private	Y			-	-		5 5		
WFLOW xx	Water flow rate of apartme	ert xx	24-02-21			Float	CRV	Real-Time			Apartment or technical room	Finnish		Raw			BAS &	TAS							Proprietary/Private	Y						5 5		
EA_xx	xx		24-02-21			Float	CSV	Real-Time			Apartment or technical room	Finnish		Raw			BAS &	TAS							Proprietary/Private	Y						5 5		
														_																				
General spaces	of housing co-operative (n	not fully described):	24-02-21			Float	CSV	Real-Time			Kavot	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
ENH	section 1		2402-2			Float	CSV .	Real-Time			Kolust	Finish		Power Docent			D45 &	TAD							Proprietary/Private Proprietary/Private	N				-		6 6		
EOUT2	section 2		24-02-21			Float	CAV	Real-Time			Kaivot	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
EIN2	section 2		24-02-21			Float	CSV	Real-Time			Kaivot	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
EPARK	hals		24-02-21			Float	CSV	Real-Time			Kaivot	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
ECAR	charging		24-02-21			Float	CSV	Real-Time			Kaivot	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
						-		_										_											_					
Weather statio	in data (not felle described)	D-				-																			-					-				+
T OUT	O priver termorature	0.	24.02.21		-	Float	C9V	Real-Time			Weather station	Finnish		Raw			BAS &	TAS							Proprietary/Private	N			-			5 5		
RHO_OUT	Outoor humidity		24-02-21			Float	CSV	Real-Time			Weather station	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
SOLH	Solar radiation, horizontal		24-02-21			Float	CSV	Real-Time			Weather station	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
SOLD	Solar radiation, diffuse		24-02-21			Float	CSV	Real-Time			Weather station	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
SOLWEST	west	optional	24-02-21		-	Float	CSV	Real-Time			Weather station	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
SOLSOUTH	south	optional	24-02-21			Float	CSV	Real-Time			Weather station	Finnish		Raw			BAS &	TAS							Proprietary/Private	N						5 5		
WINDD	Wind drooting		24-02-21			Float	COV	Roal Time			weather station	Finish		Power Docent			BAS &	TAG							Proprietary/Private Proprietary/Private	N						6 6		



Spanish demo site:

		General Info			Data Asset Features Dataseters														bility	Data Asset Ri	Data	ant		
																Dependency /								
						_			Historical Data	Temporal	Spacial	Spacial				Linking to	Accessibility	Frequency of						
ID	Data Source	Description	Datasets Available	Volume	Variety	Туре	Format	Velocity	Availability	Coverage	Coverage	Language	Standards	Veracity	Granularity	Other Sources	Method	Updates	Documentation	Privacy	License	Accuracy	Completeness	Timeliness
(Unique identifier			(Unique identifier following the									(e.g. Spanish,	[List the international	(Raw, Pre-	[The temporal "granularity" of the	-	(Through API, A	(Real-time, Every X minutes / hours,	the API or data sample (incl. the location and	Proprietary (to be shared with appropriate licensing with the demonstrator partners) /	currently applied, e.g. CC Attribution-NonCommercial-	(Measure of correctness and precision, e.g.	(Degree to which data asset is	a
following the	The source		convention	[X GBs / records /	Structured /							Finnish, Franch,	standards to which	processed,	data, e.g. per	[Y/N, If Y, list the	downloadable file	Daily, Weekly,	the name of the file in	Private (to be shared with appropriate	ShareAlike (CC BY-NC-SA),	whether the dataset is	sufficient in scope	2, [Howlong a data
convention	(organisation) that	A bailed also existing of the state way of	"ODS_Organisation	transactions per	Unstructured /	[Text / Image /	[csv, xml, json,	(Real-time, Near	0/88	(Come To)	(in constitution)	Dutch, German,	a data asset	Processed Data	minute / hour / da	y other sources or	As database	Monthly, Yearly,	the EXCESS	licensing within the demonstrator / Public	or Case-by-Case Bilateral	effor-free, Ranked 1	depth, Ranked 1	asset remains up
OPEN 1 (they	provides the data	A bitle description of the data asset	name_wno j	nour / day / monar	Semisiruciared	y Oblery	ounary	Rearene, Bachy	[1/14]	[PIOIII 10]	Locatoris	Englishj	compilesy	assury	Thorny	codensisy	extract, Oakerj	Canady	repository	(available to av))	Agroantany	(LOW) * D (Phigh))	(LOW) - D (High))	lordatej
are not open																								
actually)	CEN	Exterior Temperature	ODS_CEN_1	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_2	CEN	Solar Radiance on Horizontal	ODS_CEN_2	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_3	Users	Aggregated electricity consumption in dwellings	ODS_CEN_3	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_4	Users	Aggregated HVAC consumption in dwellings	ODS_CEN_4	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_5	CEN	PV generation electricity	ODS_CEN_5	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_6	CEN	Electricity bought from the grid	ODS_CEN_6	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_7	CEN	Electricity sold to the grid	ODS_CEN_7	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_8	CEN	Self-Consumption ratio	ODS_CEN_8	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_9	CEN	Electricity consumption in Heat Pumps	ODS_CEN_9	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_10	CEN	Thermal production consumption in Heat Pumps	ODS_CEN_10	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_11	CEN	Electricity consumption in Pumps	ODS_CEN_11	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_12	CEN	Electricity consumption in Electric Vehicles Charg	ODS_CEN_12	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_13	CEN	Electric consumption in common zones	ODS_CEN_13	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_14	CEN	CO2 emissions (conversion from kWh from grid a	ODS_CEN_14	1 / hour	Structured	Text	csv	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_15	CEN	Aggregated Energy Balace (PEB definition)	ODS_CEN_15	1 / hour	Structured	Text	CSV	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project
OPEN_16	CEN	Flexibility	ODS_CEN_16	1 / hour	Structured	Text	csv	Batch	Y			Spanish/English		Processed	hour		API	horly		Private			5	5 End-of project

Austrian Demo site:

0	ta Description	Data Description			Data Asses Features													Data Asset Availability							Data Asset Rights				Data	a Asset Assess	nent.			
																	Dependency /		Data Asset				Update				Types of analysis				Relevance to specific			/ II
									Historical Data						Temporal	Spatial	Linking to	Data Asset	Available from	Data Asset	Accessbility	Frequency o	d Strategy			Need for	currently conducted				demonstration			
Dataset ID	Data Asset Title	Description	Date of Row Last Upd	tate Volume	Variety	Type	Format	Velocity	Availability	Temporal Coverage	Spatial Coverage	Language	Relevant Stand	lards Veracity	Resolution	Resolution	Other Sources	Owner	3nd Party	Provider	Method	Updates		Documentation	Privacy	Anonymization	on data	Accuracy	Completeness 7	Timeliness	activities i	Importance	Rationale	
															(The propose	(The sould)						Past time, Even		The documentation of the	Confidential (not to be shared at all / Proprietary (to be				Degree to which a		the relevant a class (Mc	overlight a data		
												je.g. Spanish		Jian, Per-	"granularity" of a	te 'gauarty' of t	w			The came of the	[Through API, Au	X minutes / hour	ni,	APt or data sample (incl.	stared with appropriate Sciencing with the demonstrator	[11N depending on		(Measure of correctness and	data asset is		asseria for the a	saaria for the	(Explain the	
Schoole advection following the			The date of the last update	e of SKGBS / NGG	rds/ [Structured/	Charles Charles I	day and have	a allocations about				Finish, Feech	5.41 the interval	toral processed	data, e.g. per	data, e.g. at data	kt [YN, IY, Julio			data asset	downloadable Ski	Daly, Weekly,	Append new da	b / the location and the name	partient) / Private (to be shared with appropriate	whether the class asset	je p Correlator analysis	precision, e.g. whether the dataset	ufficient in scope, (34	Rep & Gut work	specific demo sile, d	demonstration,	reasons for	
"Doursy Partner DA Bio?"	The title of the data asset	A bird description of the data asset - At instal 2-3 lines to give an overview of the data	someduters	hour/day/m	outil Semi-stuctured	f Otheri	other i	Feature Bach	0000	(Fon To)	(Locations)	English J	agait complet	42 ALLACED	/month?	area invest	code6m/	date a care owner	000	EXCESS	extent Open	oter	daa/other?	receiped	Alteraty was an one device and in Pace, personal to	personal data?	lix_l	048.0	Lost - 5 (Hatil	re-date of	(Mate)	(High)	ACTIVITY COMPANY	6.
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CTPRUS SS DA 1	I dist contablet title	I his is a description	20-01-2021	100 MB				D. DOD VYTEVIT AD TAL DOD. Desired																										
									XX ONLY IF Social Vision 77 Provide																									
											Nr (c10 mitherman) IBB. Category T. Tyrus of																							
P17-1010101-00-T01	TEMPLATE		19-02-2021	records	atructured	Float	JSON	Real-Time	Y	from: set up time: to: current	Senapr. AA.Nr of Senapr	English	RestluAPI	Raw	12 per hour	roominachine	N D	IAR	n	TSI	AP1	Real-time	Append		Private	N	100							
P17-TAA	Site based data TEMPLATE	T type of sensor, AA identifier of sensor	19-02-2021	records	atructured											abe																		
P17T01	Site Temp	site based (P17) local weather data current Temperature	19-02-2021	records	atructured	Float	JSON	Real-Time			site	English	RestluAPI	Raw		1.00	N D	IAR	y .	openweatherna	AP1	Real-time	Append											
P17T02	Site ForeCast Temp	site based (P17) local weather data forecast Temperature	19-02-2021	records	atructured	Float	JSON	Real-Time			alte	English	RestluAPI	Raw		abe	N B	IAR	8	openweatherne	AP1	Real-time	Append											
												2																						
P17-10-88-TAA	Building based data TEMPLAT	TE BB category/machine identifier, T type of sensor, AA identifier of	19-02-2021	records	atructured						building					building																		
P17-10-00-H01	Building Heating	building (P17-10) heating and cooling power consumption	19-02-2021	records	structured	Float	JSON	Real-Time	Y	from: set up time; to: current	building	English	RestluAPI	Raw	12 per hour	building	N E	IAR	n	TSI	API	Real-time	Append		Private	N	13W	4	5	5	5	5)	ccupant's comfort	
P17-10-00-E01	Building Electricity	building (P17-10) electrical power consumption	19-02-2021	records	structured	Float	JSON	Real-Time	Y	from: set up time; to: current	building	Englah	RestluAPI	Raw	12 per hour	building	N E	IAR	n	TSI	API	Real-time	Append		Private	N	13W	4	5	5	5	5)	inergy optimization	
P17-10-00-P01	Building Electricity generation	 building (P17-10) electrical power production (photo voltaic) 	19-02-2021	records	atructured	Float	JSON	Real-Time	Y	from: set up time; to: current	building	Englah	RestlukPi	Raw	12 per hour	building	N	IAR	n	TSI	API	Real-time	Append		Private	N	13W	4	5	5	5	5)	inergy optimization	
				_	_	-						2		_	_																			
P17-10FFY-BB-TAA	dwelling based data TEMPLATE	x10 FF floor (FF >= 10: ground level and above-ground floors; FF < 10: a	19-02-2021	records	also should	First	ICCN.	Red Time	~	Annual and the first fact second	dealing	Facial	Reath 1578	Base	47 mm hours	dveling		140		7.51	174	Floral states	Inned		Ref. and a								an analy maded	
P1710101-00F01	Develop Flootick	dwalling (PT7-10101) recalling and cooling power consoliption	40.02.2024	records	alastared	Flored	JUCKI I	Real Time		from and up from to content	dealling	Fasiah	Reathing	Base	42 per hour	dealing	6 6	140	<u>c</u>	7.01	101	Real lines	Anneal		Printe	N .					5		Acceptants comment	
P17.40401-00-01	Deeling Decropy	dealing (P17-10101) electrical power consumption	19-02-2021	records	attactured	had	ISON	Real-Time	Y	from set up time, to current	deallog	English	Reathdapt	Daw	on change	dualing	N I	40		10	401	Real-time	Accend		Private	Y	199		2	2	2	2	nergy optimizer Onl-out of	00.00
																	r (-	-	-	-		and approximately and a	-
P17.10EEY77.88.TAA	haved data TEMPI ATE 1 - 5 ne	PATE from (EE >= 10) around level and shows around from: EE < 10 a	19,02,2021	recrete	atactured						2007					mom																		
P17-1010101-00-T01	Room Temperature	room temperature	19-02-2021	records	atructured	Float	JSON	Real-Time	Y	from: set up time: to: current	(1997)	English	ReathAPI	Raw	12 per hour	reem	N F	IAR	n	TSI	AP1	Real-time	Append		Private	N	100	4	5	5	5	5	ccupant's confert	
P17-1010101-00-F01	Room Hamidity	room humidity	19-02-2021	records	atructured	Float	JSON	Real-Time	Y	from: set up time: to: current	reem	English	RestuAPI	Raw	12 per hour	room	N E	IAR	n	TSI	AP1	Real-time	Append		Private	N	1200	4	5	5	4	4)	occupant's comfort	
P17-1010101-00-L01	Room Luminance	room luminance	19-02-2021	records	atructured	Float	JSON	Real-Time	Y	from: set up time; to: current	noom	English	RestluAPI	Raw	12 per hour	room	N E	IAR	n	TSI	AP1	Real-time	Append		Private	N	raw.	4	5	5	5	5)	ccupant's confort	
P17-1010101-00-C01	Room CO2 Concentration	room CD2 concentraction	19-02-2021	records	atructured	Float	JSON	Real-Time	Y	from: set up time: to: current	1997)	English	Reath(API	Raw	12 per hour	room	N E	IAR	n	TSI	AP1	Real-time	Append		Private	N	1200	4	5	5	4	4	ccupant's confort	
P17-1010101-00-H01	Room Heating	room heating and cooling power (calculated)	19-02-2021	records	atructured	Float	JSON	Real-Time	Y	from: set up time: to: current	1997)	English	ReathAPI	Processed	12 per hour	room	linked with comit	IAR	n	TSI	AP1	Real-time	Append		Private	N	calculated based on re	4	5	5	5	5	ccupant's confort	
P17-1010101-00-D01	Room Shading	room shading	19-02-2021	records	atructured	Ficat	JSON	Real-Time	Y	from: set up time: to: current	mon	English	ReathAPI	Raw	on change	room	N E	IAR	n	TSI	AP1	Real-time	Append		Private	N	120	4	5	5	4	41	occupant's confort	
D17 4010101 00 C01	Room Termination Fairclet	and because the second second	40.03.2024	an and a	a to only on other	Flored	HE CAL	Real Time	14	from and on them to mental		Fastal	Thread A how	Deer	an shares		A1	140		TEL	174	Real time	farmed.		Delumin	b.I							and a second sec	



Belgian demo site:

	Data Description		Data Asset Features															Data Asset Avail	ability			Data Asset Rights Data Analysis												
																	Dependency /		Data Annet				Undate				Turnes of analysis				mette			
									Historical Dat	Terroral	Section				Terrooral	Scotlal	Linking to	Data Asset	Available from	Data Arent	Accessibility	Eremency of	Statemy			Next for	currently conducted				demonstration			
Dataset ID	Data Asset Title	Description	Date of Row Last Lindate	Volume	Variaty	Turne	Economi	Valority	Availability	Coverson	Courses	Language 1	Delevant Standards	Verselity	Resolution	Perchtion	Other Sources	Owner	Jed Party	Drowider	Method	Undates	are made	Documentation	Friency	Accommitation	on data	Accuracy	Completeness	Tradicess	artistics	Importance	Pationale	(
Unim D	Care Mann Tan		Case of Now Case Optime	- Count	· · · · · ·	1994	Por mark	vince iy	And a state of the	Contrage	Contrage	Je g. Spanish		(Ray Pro-	(The semporal "granularity" of the	[The spatial 'granularity' of the	COMP SECON	Carta	auraty	The name of the	(Through APL As	jReal-time, Every X misutes / tours,		he documentation of the PLor data sample (incl	Confidential (not to be shared at all) / Proprietary (to be shared with appropriate licensing with the demonstrato	r [fill depending on	on case	Measure of correctness and	Degree to which a data asset is	1	How relevant a data p	Voe critical a data asset is for the	(Explain the	
/Unique identifier following d conversion "Country_Partner_DA_thro	The side of the data asset	A brief description of the data asset - At issue 2-2 lines to give an overview of the data	The date of the bast update of this rowin the specific spreadsheet	[X Gills / records / transactions per i hour / day / month] S	(Structured / Unstructured / Semi-structured)	[Text/Image Other]	i/ (cev, xml, jack	n, jReafdme, Neo Reafdme, Batt	ping	(Feen To)	(Locations)	Fitnish, French, Dutch, German, a English]	[List the international bindents to which a date asset complies]	Processed Processed Data asset	data, e.g. per minute / hour / day /month[data, e.g. at district /zone/building/ area level[(Y/N, If Y, list the other sources or codeliats)	The name of the data asset cener	ring	data asser provider in EXCESS	downloadable file, As database extract, Otherj	Daly, Weekly, Monthly, Yaarty, otherj	(Append newdata/ th Replace existing o data/other)	e location and the name (the file in the EXCESS repository)	e partners) / Private (to be shared with appropriate 5 Scensing within the demonstrator / Public (available to all)	whether the data asset contains sensitive or personal data]	je.g. Correlation analysis for, Predictive analysics for]	precision, e.g. whether the au dataset is effor-free, Ranked 1 (Low) - 5 (High))	depth, Ranked 1 (Low) - 5 (High)	fowlong a data set remains up- to-date)	.pecific demo site, Ranked 1 (Low) - S R (High)(demonatrator, lanked 1 (Low) - 5 (High)j	reasons for importance minking	Commenta
	District heating supply temperature	Supply temperature selpoint to the demo buildings	17-02-21		Structured	Test, Float,	jaon	Near Real-tim	YN			English		Processed	5 min	Area level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TBD	Proprietary	N			5	5 min	5	5		
	District heating return temperature	Return temperature selpoint to the demo buildings	17-02-21		Structured	Text, Float,	. jaon	Near Real-tim	N YON			English		Processed	5 min	Acea level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	District heating flowrate	District heating fourse	17-02-21		Structured	Text, Float,	. jaon	Near Real-tim	 YON 			English		Processed	5 min	Area level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	District heating total heat demand	District heating total heat demand	17-02-21		Structured	Text, Float,	. jaon	Near Real-tim	 YON 			English		Processed	5 min	Area level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Central thermal energy storage tank SOC	State of charge of central storage tank	17-02-21		Structured	Text, Float,	. jaon	Near Real-tim	N YON			English		Processed	5 min	Area level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 1 condensor supply temperature	Heat pump 1 condensor supply temperature	17-02-21		Structured	Text, Float,	. jaon	Near Real-tim	N YON			English		Processed	5 min	Area level	N	Cordium	Y	VITO	AP1, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 2 condensor supply temperature	Heat pump 2 condensor supply temperature	17-02-21		Structured	Text, Float,	. jaon	Near Real-tim	N YON			English		Processed	5 min	Area level	N	Cordium	Y	VITO	AP1, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 3 condensor supply temperature	Heat pump 3 condensor supply temperature	17-02-21		Structured	Text, Float,	. jaon	Near Real-tim	 Y/N 			English		Processed	5 min	Area level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 1 condensor return temperature	Heat pump 1 condensor return temperature	17-02-21		Structured	Test, Float,	jaon	Near Real-tim	YN			English		Processed	5 min	Acea level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 2 condensor return temperature	Heat pump 2 condensor return temperature	17-02-21		Stuctured	Text. Figat	. iaon	Near Real-tim	YN YN			English		Processed	5 min	Acea level	N	Cordium	Y	VITO	APL CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 3 condensor return temperature	Heat pump 3 condensor return temperature	17-02-21		Structured	Text. Figat	. iaon	Near Real-tim	YN YN			English		Processed	5 min	Acea level	N	Cordium	Y	VITO	APL CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 1 evaporator supply temperature	Heat pump 1 evaporator supply temperature	17-02-21		Structured	Text. Figat	. iaon	Near Real-tim	YN YN			English		Processed	5 min	Acea level	N	Cordium	Y	VITO	APL CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 2 evaporator supply temperature	Heat pump 2 evaporator supply temperature	17-02-21		Structured	Text. Figat	. iapn	Near Real-tim	YN YN			English		Processed	5 min	Acea level	N	Cordium	Y	VITO	APL CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 3 evaporator supply temperature	Heat pump 3 evaporator supply temperature	17-02-21		Structured	Text. Figat	. iapo	Near Real-tim	YN YN			English		Processed	5 min	Acea level	N	Cordium	Y	VITO	APL CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 1 evaporator return temperature	Heat pump 1 evaporator return temperature	17-02-21		Stuctured	Text. Float	. iapo	Near Real-tim	N YN			English		Processed	5 min	Acea level	N	Cordium	Y	VITO	APL CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Meat rump 2 manyraky return temperature	Heat rumo 2 management ration temperature	17,03,21		Sturbard	Text Elevel	inn	Near Deal.tre	N YIN			Endah		Decrement	5 min	Area level	N	Costum	Y	VITO	ADL CTV	5 min	Bearl only	700	Drovietary	N			5	5 min	5	5		
	Meat runno 3 exercitative seture temperature	Heat rump 3 manyorator return temperature	17,03,21		Sturbard	Test Eleat	lann	Near Deal-tree	YN			Endah		Processed	5 min	Area level	N	Contum	Ŷ	VITO	ADL CITY	5 min	Bearl only	700	Direction	N				5 min		- 5		
	Meat rump 1 condensor ficurate	Heat rump 1 condenant linerale	17,03,21		Sturbard	Test Eleat	inco.	Near Deal-tree	YN			Endah		Processed	5 min	Area level	N	Contum	Ŷ	VITO	ADL CITY	5 min	Bearl only	700	Direction	N				5 min		- 5		
	Heat pump 2 condensor flowrate	Heat pump 2 condensor flowrate	17-02-21		Stuctured	Test Float	apn	Near Real-tim	YN			English		Processed	5 min	Acea level	N	Cordium	Ŷ	VITO	API, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	Heat pump 3 condensor flowrate	Heat pump 3 condensor flowrate	17-02-21		Stuctured	Test Float	apn	Near Real-tim	YN			English		Processed	5 min	Acea level	N	Cordium	Ŷ	VITO	API, CIV	5 min	Read only	TEO	Proprietary	N			5	5 min	5	5		
	bleat runno 1 exercisaire ficultais	Heat rump 1 manyorator finansia	17,03,21		Sturbard	Text Elevel	inco.	Near Deal.6m	YIN			Endish		Processed	5 min	Area level	N	Contum	Ŷ	VITO	ADL CITY	5 min	Bearl only	770	Direction	N				5 min				
	Maria and Anna and An	Maria anama 7 a mananing Paranta	(7.02.24		Destand	Test Float		Mana Real for	- VM			Faster		Deserved	E min	Areas based	M	Contine	×	1170	478	1 100	Flored only	700	Description					f min				
	Mail come 2 manuals financia	Media and A strand and increase	17 00 01		Destantes	Test First	- Martin	New Real for	- VM			English		Processed	d min	Area local		Cardian	×.	MTO	A78.000	1 100	Parad only	780	Proceeding					S min				
	bleat rumo 1 thermal output	Heat rump 1 thermal outruit	17,03,21		Sturbard	Test Eleat	lann	Near Deal.tree	YN			Endah		Processed	5 min	Area level	N	Contum	Ŷ	VITO	ADL CITY	5 min	Bearl only	700	Direction	N				5 min		- 5		
	bleat rumo 2 thermal output	Heat rump 2 thermal outruit	17,03,21		Sturbard	Test Eleat	inco.	Near Deal-tree	YIN			Endah		Processed	5 min	Area level	N	Contum	Ŷ	VITO	ADL CITY	5 min	Bearl only	700	Direction	N				5 min		- 5		
	bleat rumo 3 thermal output	Heat rump 3 thermal output	17,03,21		Sturbard	Test Eleat	inco.	Near Deal-tree	YN			English		Processed	5 min	Area level	N	Contum	Ŷ	VITO	ADL CITY	5 min	Bearl only	700	Direction	N				5 min				
	Ideal rumo 1 anerty consumption	Heat rump 1 energy consumption	17,03,21		Sturbard	Text Elevel	inco.	Near Deal-tree	YIN			English		Processed	5 min	Area level	N	Contum	Ŷ	VITO	ADL CITY	5 min	Bearl only	700	Direction	N				5 min				
	Ideal rumo 2 anerty consumption	Heat rump 2 energy consumption	17,03,21		Sturbard	Text Elevel	inco.	Near Deal-tree	YIN			Endish		Processed	5 min	Area level	N	Costum	Ŷ	VITO	ADL CTV	5 min	Bearl only	770	Direction	N				5 min				
	Mani sumo 3 second second second	Mad many 7 many annual an	(7.02.24		Destant	Test Float		Mana Real for	- VM			Faster		Deserved	E min	Arrest Intend	M	Contine	×	1170	478	1	Flored only	700	Description					f min				
	THE COLOR STREET CONTRACTOR	Tenergy a triangly consumption	17-02-21		Destantes	Test First		New Real for	NM NM			English		Processed	5 min	Area loves		Cardian		MTO	A71.000	d min	Frank only	780	Proprietary					S min				
	TTES suppry an person of	Temperature of the fluid exterior for FTFF	17-02-21		Destantes	Test First		New Real for	NM NM			English		Deserved	5 min	Area loves		Cardian		MTO	A71.000	5 100	Parad only	780	Proprietary					5 min				
	STEE Amarin	NTEP Excession	17-02-21		Developed	Test Florad	. pears	New Real for	NM NM			English		Deserved	5 min	Area loves		Cardian	÷.	MTO	A71. CBV	5 100	Read only	780	Proprietary					5 min				
	STEE Assessed assisted	Mark and a differ WYER	17-02-01		Developed	Test Florad	. pears	New Real for	N NM			English		Deserved	5 min	Area loves		Cardian	÷.	WTO .	A71. CBV	6 min	Read only	780	Descriptions					5 min				
	Disease descend by Rec 200	Plain deplated and and alternational	17-02-21		Developed	Test Florad	. put	New Real for	N NM			English		Deseased	E min	Area loves		Cardian	÷.	WTO .	A78.000	d min	Read only	780	Descriptions					5 min				
	71/7 scenic longerships	Transmiss of the Drid service has the TVT service	17-02-21		Destantes	Test Floral	. put	New Real for	N NM			English		Deserved	E min	Area loves		Cardian	÷.	MTO	A78.000	d min	Frank only	780	Descriptions					5 min				
	PVI suppy supprairie	The parallel of the full control for the P Tripares	11-522-21		arecured.	1666, Photes,	. pears	These Polarest				E-righter		Processed		Area aver		Cordram		1110	7071, 5.87		Peak Gray	100	Proprietary					3				
	PVT reum emperature	remperature or the risid entering the PVT panels	17-02-21		STUCIFED	1400, FIGBL	. pon	Near Polae-Bits	5 T.IN			English		Processed	5 min	Aces inves	N	Cordum		110	AP1. CIV	Smin	Palad only	10D	Proprietary	N				5 min				
	PVTTOWINE	PV1 IDW38	17-02-21		STUCIFED	1400, FIGBL	. pon	Near Polae-Bits	5 T.IN			English		Processed	5 min	Aces inves	N	Cordum		110	AP1, CIV	Smin	Palad only	10D	Proprietary	N				5 min				
	PVI merma cuput	Please output or the PV I	1/-02-21	-	pructured	Het, Float,	. json	Near Real-tim	YON			unglah		Processed	o min	Acea level		Cordium	1	viTO	AP1, CIV	o min	Head only	IDD	Proprietary	N				o min				
	PV1 electrical output	PV1 electrical output	1/-02-21		pructured	Het, Float,	. json	Near Real-tim	YON			unglah		Processed	o min	Acea level		Cordium	1	viTO	AP1, CIV	o min	Head only	IDD	Proprietary	N				omn				
	Solar Imagabon	sour inscission on the roor or the demo buildings	1/-02-21	-	pructured	Het, Float,	. json	Near Real-tim	Y/N			unglah		Processed	o min	Acea level		Cordium	1	viTO	AP1, CIV	o min	Head only	IDD	Public	N				omn				
	Curside semperature	Cutaice temperature at the cemo buildings	1/-02-21	-	pructured	Hot, Float,	. json	Near Real-tim	9 YON			unglah		Processed	o min	Acea level		Cordium	1	vito	AP1, CIV	o min	Head only	10D	Public	N				omn		-		
	wind speed	wind speed at the demo buildings	1/-02-21		pructured	Hot, Float,	. json	Near Real-tim	9 YON			unglah		Processed	o min	Acea level	Ň	Cordium	1	viTO	AP1, CIV	o min	Head only	IBD	Public	N				o min				
	Wind direction	Wind direction at the demo buildings	17-02-21		Structured	Ted, Float,	. jaon	Near Real-tim	NN YON			English		Processed	5 min	Area level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Public	N			5	5 min	5	5		
	Apartment 120 indoor temperature	Apartment 120 indoor temperature	17-02-21		Structured	Ted, Float,	. jaon	Near Real-6m	NN YON			English		Processed	5 min	Dwelling level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Confidential / private	Y			5	5 min	5	5		
	Apartment 120 heat consumption	Apartment 120 heat consumption	17-02-21		Structured	Ted, Float,	. jaon	Near Real-tim	NN YON			English		Processed	5 min	Dwelling level	N	Cordium	Y	VITO	API, CIV	5 min	Read only	TEO	Confidential / private	Y			5	5 min	5	5		
	Apartment 120 sensor x	Apartment 120 sensor x	17-02-21		Structured	Ted, Float,	. jaon	Near Real-tim	9 Y/N			English		Processed	5 min	Dwelling level	N	Cordium	Ŷ	OTIV	API, CIV	5 min	Read only	TED	Confidential / private	Y			5	5 min	5	5		
					a second second	a second a filment		· some Dead firm				 analisis 		A DECEMBER OF THE OWNER	a seis	a support of the set		· · · · · · · · · · · · · · · · · · ·					· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·									